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Kuncheria et al.

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(54) **MANAGING CUSTOMER RELATIONSHIP USING MULTIPLE CHAT SERVERS DESIGNED TO INTERFACE WITH SERVICE APPLICATIONS**

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(73) Assignee: **Oracle International Corporation**, Redwood Shores, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 104 days.

(21) Appl. No.: **15/957,932**

(22) Filed: **Apr. 20, 2018**

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(51) **Int. Cl.**
H04L 12/58 (2006.01)
H04L 29/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 51/046*** (2013.01); ***H04L 51/16*** (2013.01); ***H04L 67/10*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04L 67/24; H04L 67/1095; H04L 51/02; H04L 51/04; H04L 51/046; H04L 67/10; H04L 67/1036
(Continued)

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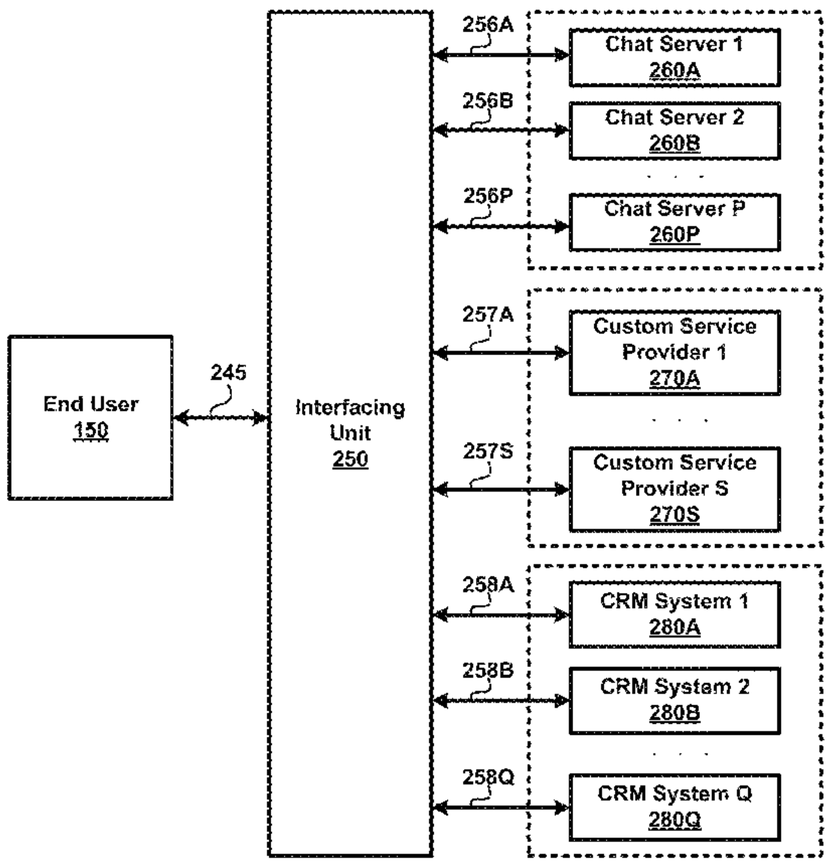
Primary Examiner — James N Fiorillo
(74) *Attorney, Agent, or Firm* — IPHorizons PLLC; Narendra Reddy Thappeta

(57) **ABSTRACT**

An interfacing unit provided according to an aspect of the present disclosure facilitates an user to be serviced based on multiple chat servers in a single chat session. In an embodiment, the interfacing unit receives a request on a chat session for a chat conversation from a user, identifies a first suitable chat server for generating responses for the chat conversation, and forwards a first sequence of inputs received from the end user to the first suitable chat server. The corresponding responses are forwarded back to the end user. The interfacing unit then forwards a received second sequence of inputs to a second chat server to generate a second sequence of messages corresponding to the second sequence of inputs. The interfacing unit forwards the second sequence of messages as respective responses to the second sequence of inputs.

20 Claims, 18 Drawing Sheets



(52) **U.S. Cl.**
CPC ***H04L 67/1036*** (2013.01); ***H04L 67/1095*** (2013.01); *H04L 51/02* (2013.01)

(58) **Field of Classification Search**
USPC 709/204, 206, 227
See application file for complete search history.

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WO	WO/2017/172651		5/2017

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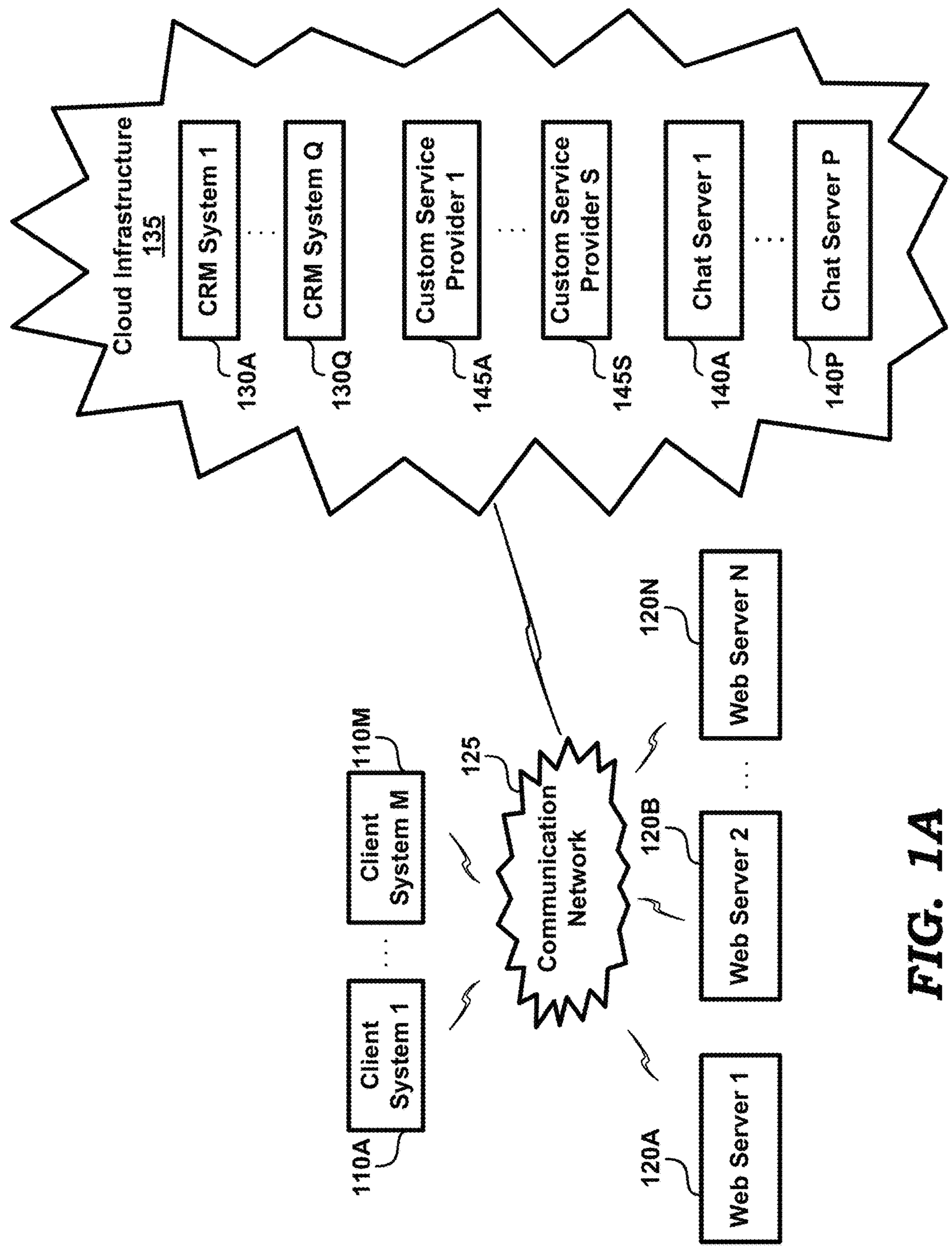

Cloud Infrastructure
135
CRM System 1
130A
CRM System Q
130Q
Custom Service Provider 1
145A
Custom Service Provider S
145S
Chat Server 1
140A
Chat Server P
140P
Client System 1
110A
Client System M
110M
Communication Network
125
Web Server 1
120A
Web Server 2
120B
Web Server N
120N

FIG. 1A

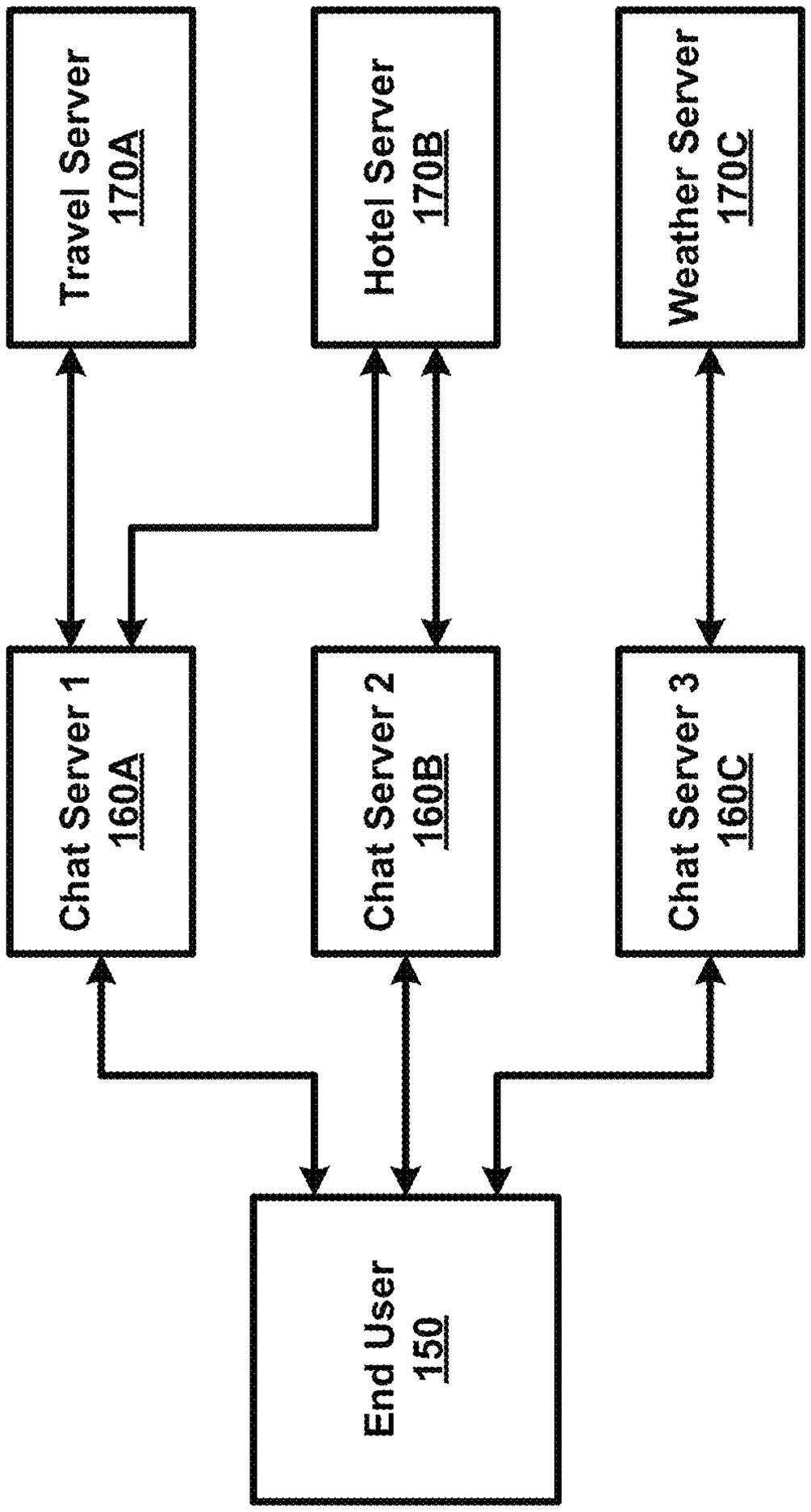


FIG. 1B (Prior Art)

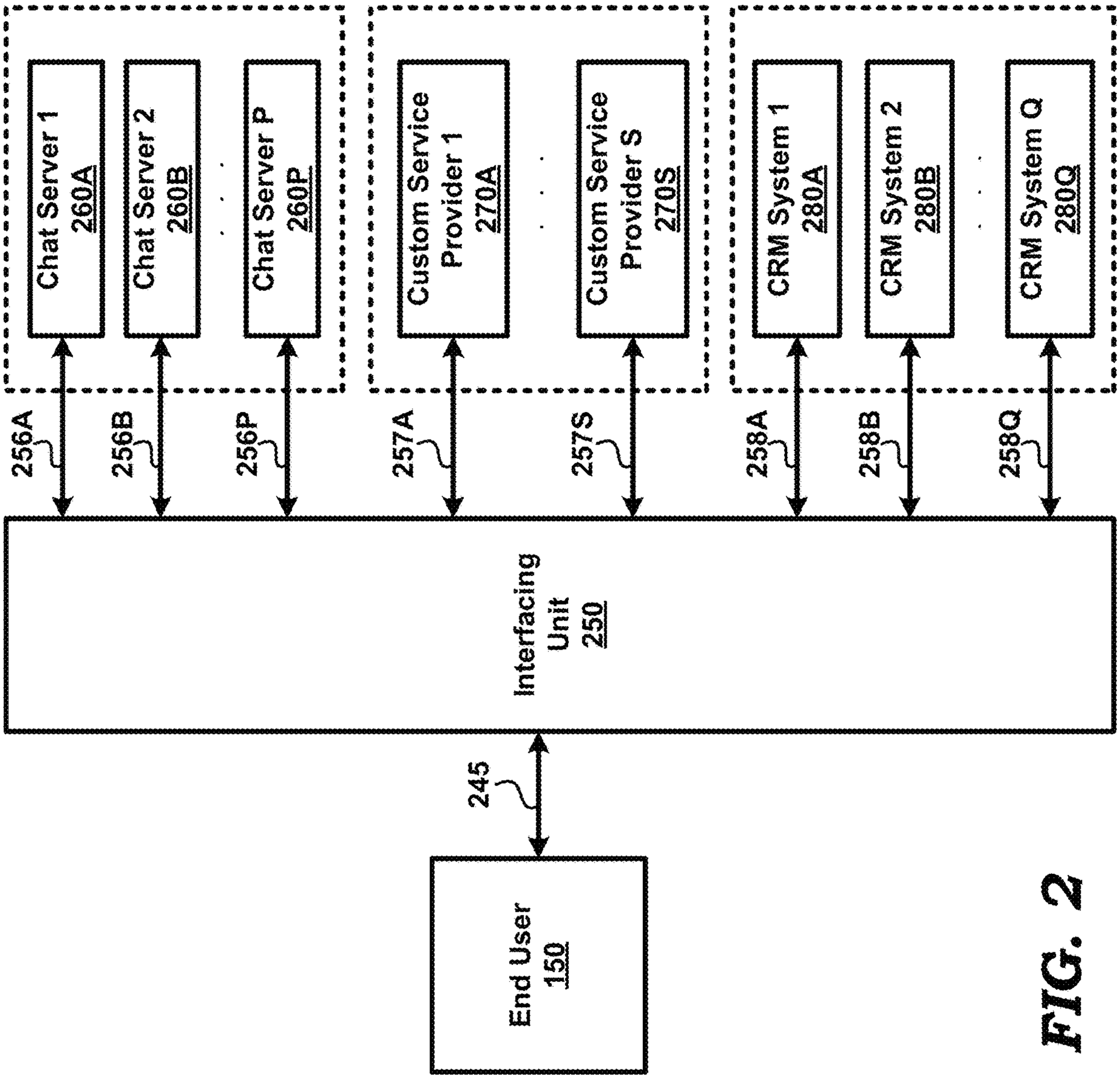

Chat Server 1
260A
Chat Server 2
260B
Chat Server P
260P
Custom Service Provider 1
270A
Custom Service Provider S
270S
CRM System 1
280A
CRM System 2
280B
CRM System Q
280Q
256A
256B
256P
257A
257S
258A
258B
258Q
Interfacing Unit
250
245
End User
150

FIG. 2

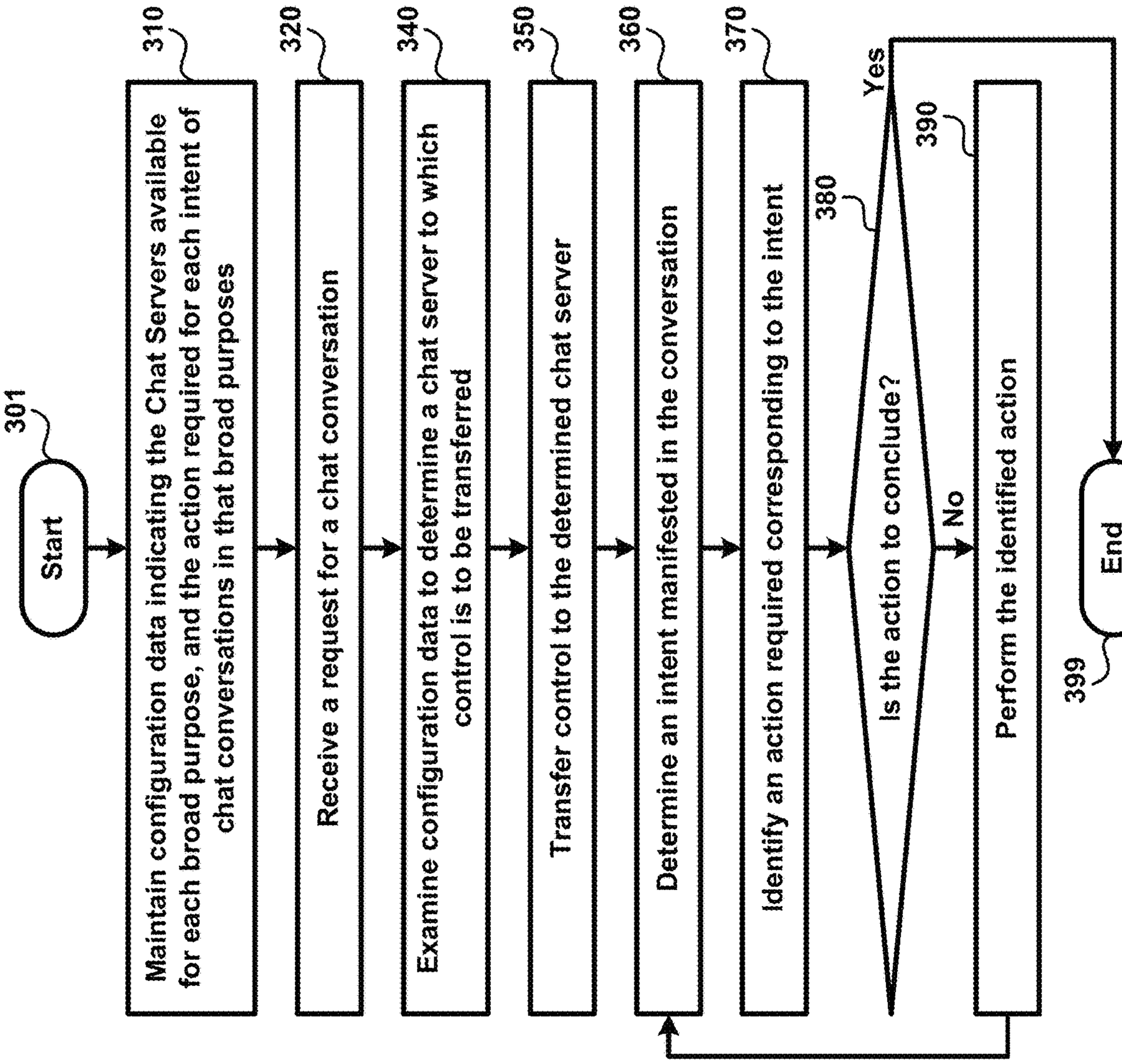

301
Start
Maintain configuration data indicating the Chat Servers available for each broad purpose, and the action required for each intent of chat conversations in that broad purposes
310
Receive a request for a chat conversation
320
Examine configuration data to determine a chat server to which control is to be transferred
340
Transfer control to the determined chat server
350
Determine an intent manifested in the conversation
360
Identify an action required corresponding to the intent
370
Is the action to conclude?
380
No
Yes
Perform the identified action
390
End
399

FIG. 3

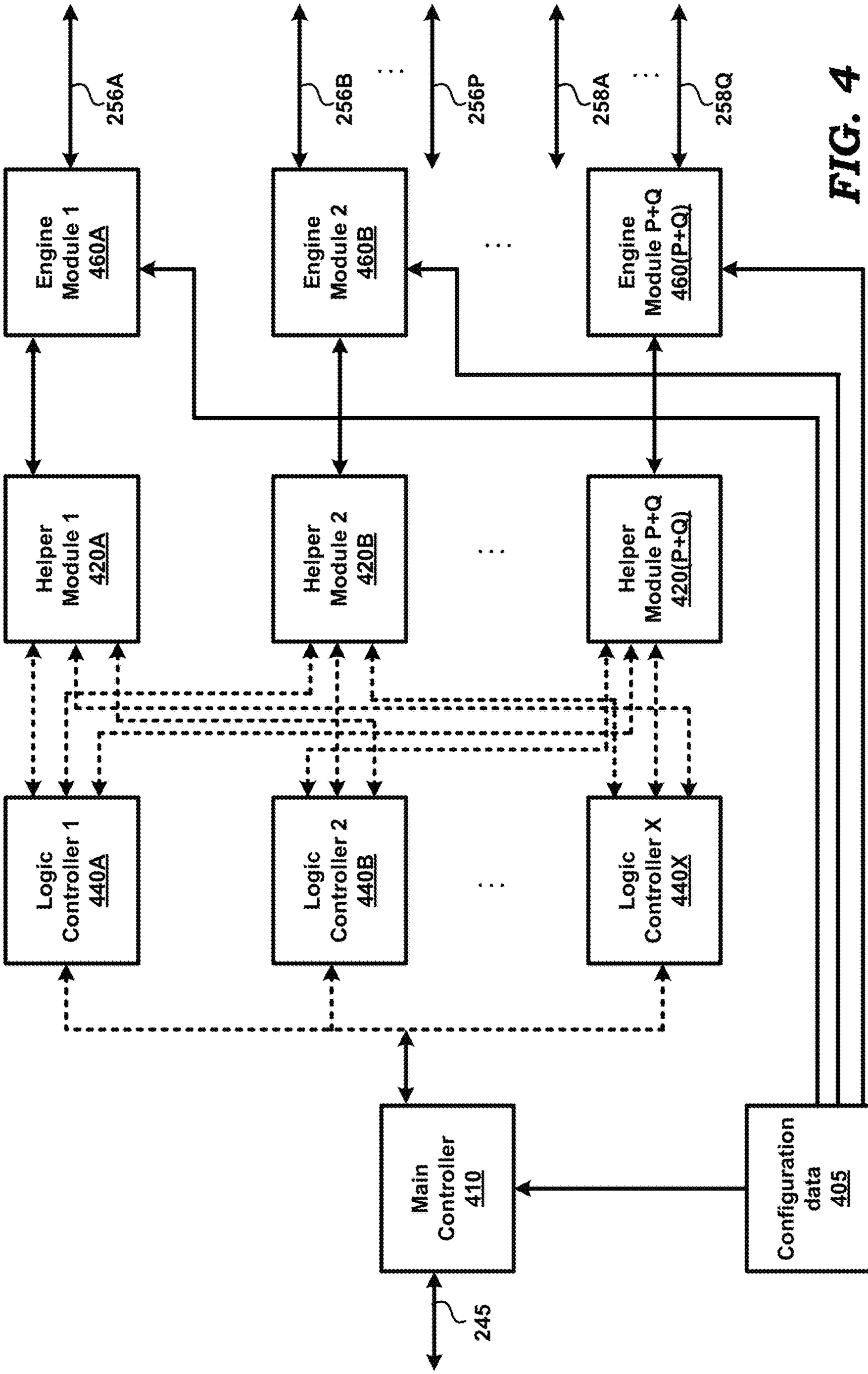

256A
256B
256P
258A
258Q
Engine Module 1 460A
Engine Module 2 460B
Engine Module P+Q 460(P+Q)
Helper Module 1 420A
Helper Module 2 420B
Helper Module P+Q 420(P+Q)
Logic Controller 1 440A
Logic Controller 2 440B
Logic Controller X 440X
Main Controller 410
Configuration data 405
245

FIG. 4


{
"name": "Tripmaker Bot",
"description": "This is the bot configuration file",
"type": "admin",
"bots": [
{
"Module-1": {
"Travel": [
{
"name": "travel.ai",
"description": "nlp",
"applicationId": "TudtzI2kL0x97BmYOPjD",
"username": "secret",
"password": "secret",
"intents": {
"name": "Intents_1",
"file": "intent1"
},
"url": "service-url"
},
{
"name": "image.ai",
"description": "image",
"applicationId": "V5JVJKSpa3GvEs5yPCbH",
"username": "secret",
"password": "secret",
"intents": {
"name": "Intents_2",
"file": "intent2"
},
"url": "service-url"
},
{
"priority": "1",
"description": "Above property can be used to override default priority"
}
],
"properties" : {
"namespace" : "/business_core/src/module1",
"file": "module1"
}
},
511
515
510
512
516
513
514

FIG. 5A

```
"Module-2": {
  "Hotel": [
    {
      "name": "hotel.ai",
      "description": "nlp",
      "applicationId": "VXUht0NsFdPrLHFEDoZJ",
      "username": "secret",
      "password": "secret",
      "intents": {
                  "name": "Intents_3",
                  "file": "intent3"
                  },
      "url": "service-url"
    },
    {
      "name": "image.ai",
      "description": "image",
      "applicationId": "ftXM6R7o3JmtEjCdRLkF",
      "username": "secret",
      "password": "secret",
      "intents": {
                  "name": "Intents_4",
                  "file": "intent4"
                  },
      "url": "service-url"
    },
    {
      "priority": "2",
      "description": "Above property can be used to override default
         priority"
    }
  ],
  "properties" : {
                  "namespace" : "/business_core/src/module2",
                  "file": "module2"
                  }
}
```

521 520 522 523 524 525 526

FIG. 5B

```
"Module-3": {
  "Taxi": [
    {
      "name": "taxi.ai",
      "description": "nlp",
      "applicationId": "Sasfdam$sdfads",
      "username": "secret",
      "password": "secret",
      "intents": {
                  "name": "Intents_5",
                  "file": "intent5"
                  },
      "url": "service-url"
    },
    {
      "name": "image.ai",
      "description": "image",
      "applicationId": "aajfiikkkjkVish",
      "username": "secret",
      "password": "secret",
      "intents": {
                  "name": "Intents_6",
                  "file": "intent6"
                  },
      "url": "service-url"
    },
    {
      "priority": "3",
      "description": "Above property can be used to override default
         priority"
    }
  ],
  "properties" : {
                  "namespace" : "/business_core/src/module3",
                  "file": "module3"
                  }
}
```

528 528A 528B

FIG. 5C

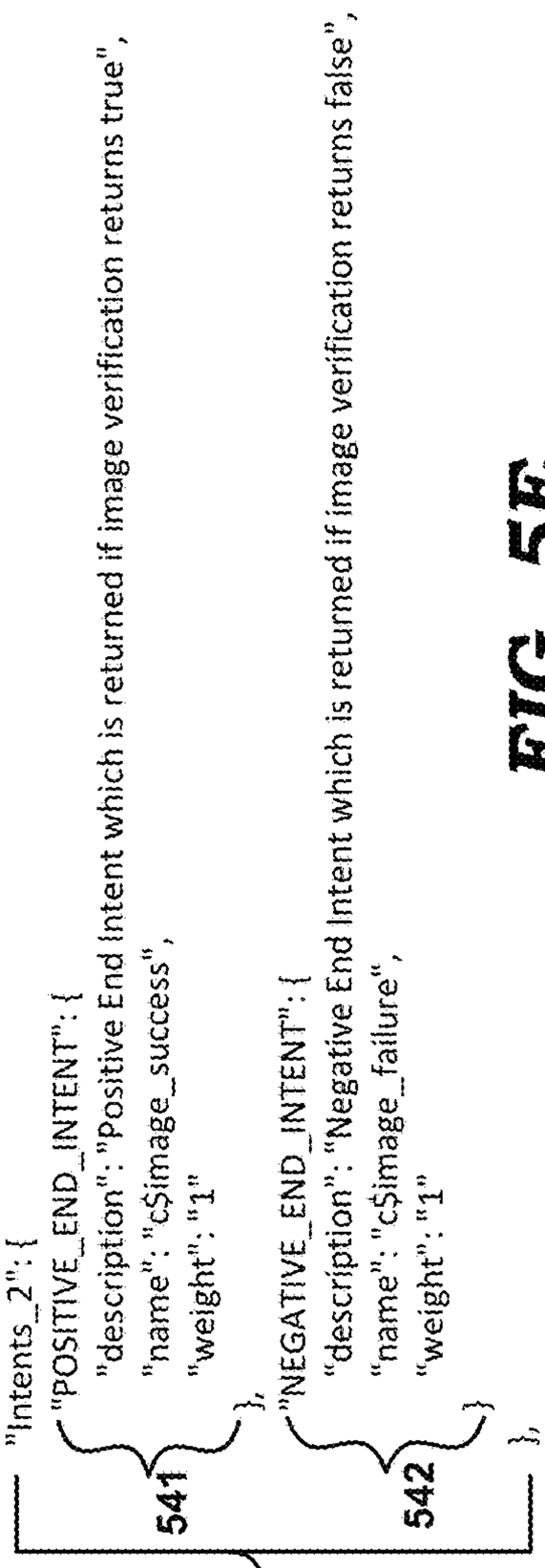

"Intents_2": {
"POSITIVE_END_INTENT": {
"description": "Positive End Intent which is returned if image verification returns true",
"name": "c$image_success",
"weight": "1"
},
"NEGATIVE_END_INTENT": {
"description": "Negative End Intent which is returned if image verification returns false",
"name": "c$image_failure",
"weight": "1"
}
},
541
542
540

FIG. 5E

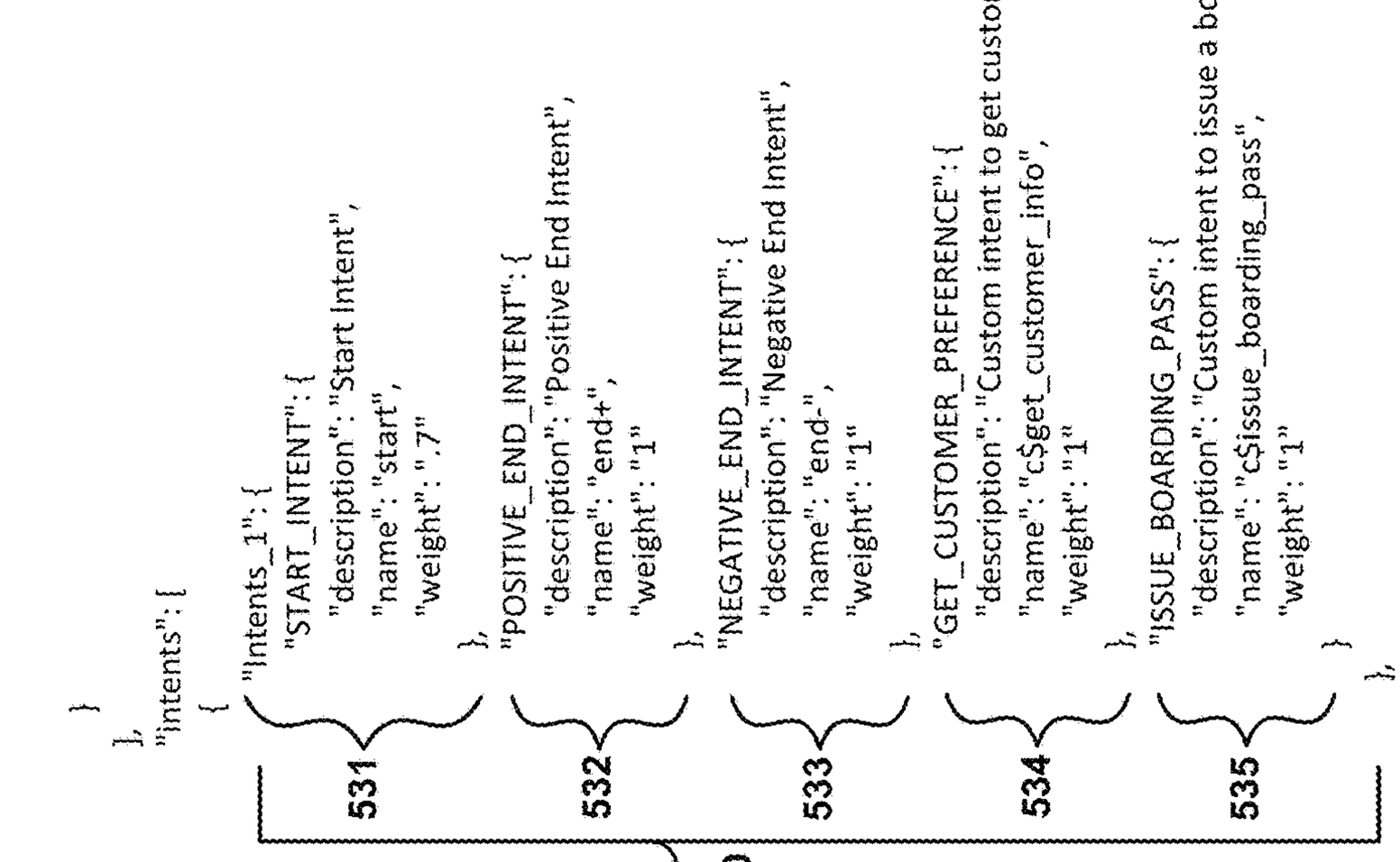

}
],
"intents": [
{
"Intents_1": {
"START_INTENT": {
"description": "Start Intent",
"name": "start",
"weight": ".7"
},
"POSITIVE_END_INTENT": {
"description": "Positive End Intent",
"name": "end+",
"weight": "1"
},
"NEGATIVE_END_INTENT": {
"description": "Negative End Intent",
"name": "end-",
"weight": "1"
},
"GET_CUSTOMER_PREFERENCE": {
"description": "Custom intent to get customer preference",
"name": "c$get_customer_info",
"weight": "1"
},
"ISSUE_BOARDING_PASS": {
"description": "Custom intent to issue a boarding pass",
"name": "c$issue_boarding_pass",
"weight": "1"
}
},
531
532
533
534
535
530

FIG. 5D

550

```
"Intents_3": {
        "START_INTENT": {
          "description": "Start Intent",
          "name": "start",
          "weight": "1"
        },
        "POSITIVE_END_INTENT": {
          "description": "Positive End Intent",
          "name": "end+",
          "weight": "1"
        },
        "NEGATIVE_END_INTENT": {
          "description": "Negative End Intent",
          "name": "end-",
          "weight": "1"
        },
        "GET_CUSTOMER_PREFERENCE": {
          "description": "Custom intent to get customer preference",
          "name": "c$get_customer_info",
          "weight": "1"
        },
        "ISSUE_HOTEL_RESERVATION": {
          "description": "Custom intent to issue a hotel reservation",
          "name": "c$issue_hotel_reservation",
          "weight": "1"
        }
    },
```

FIG. 5F

560

```
"Intents_4": {
    "START_INTENT": {
      "description": "Start Intent",
      "name": "start",
      "weight": "1"
    },
    "POSITIVE_END_INTENT": {
      "description": "Negative End Intent which is returned if image
       verification returns true",
      "name": "c$image_success",
      "weight": "1"
    },
    "NEGATIVE_END_INTENT": {
      "description": "Negative End Intent which is returned if image
        verification returns false",
      "name": "c$image_failure",
      "weight": "1"
    }
}
```

FIG. 5G

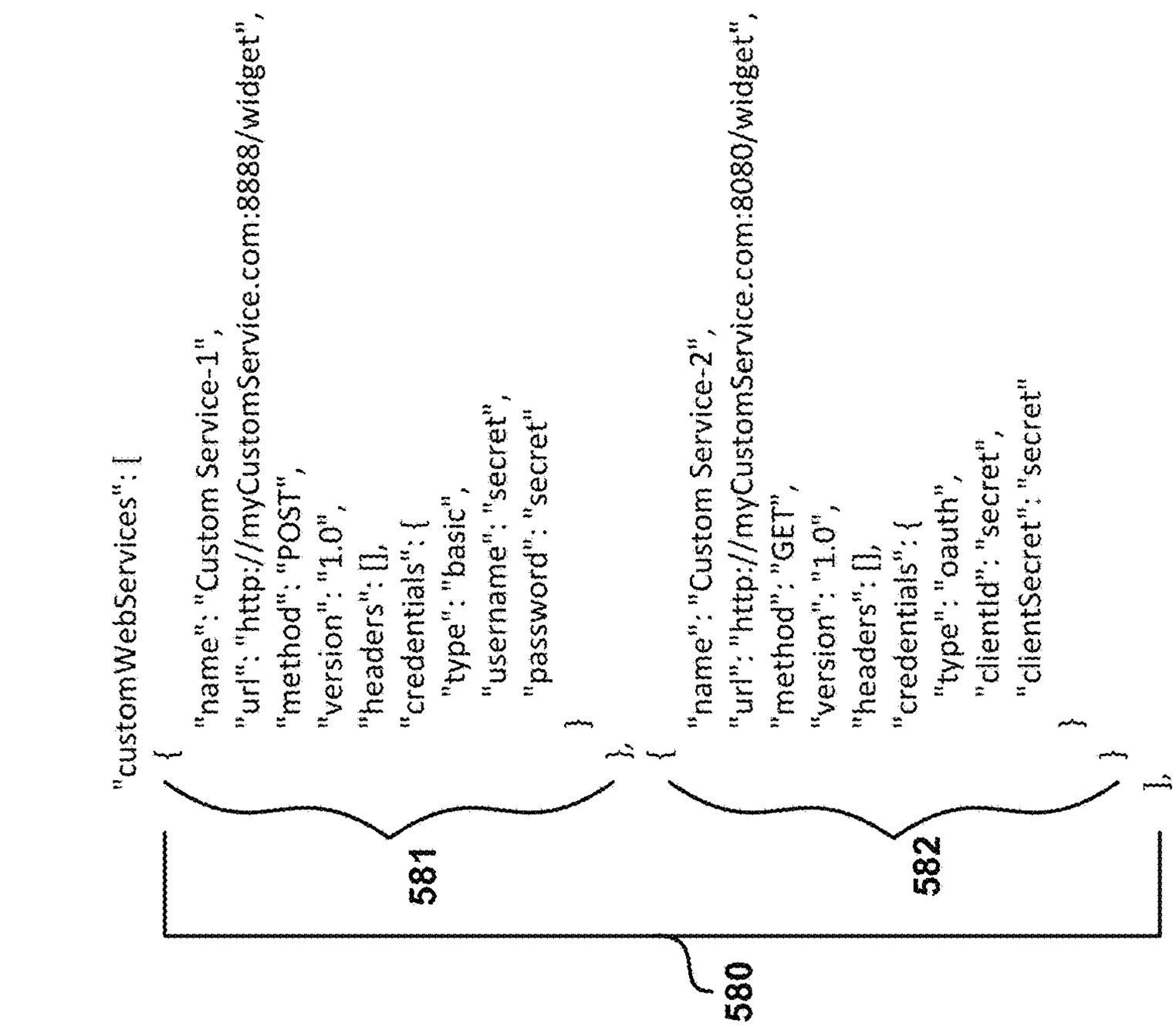

"customWebServices": [
{
"name": "Custom Service-1",
"url": "http://myCustomService.com:8888/widget",
"method": "POST",
"version": "1.0",
"headers": [],
"credentials": {
"type": "basic",
"username": "secret",
"password": "secret"
}
},
{
"name": "Custom Service-2",
"url": "http://myCustomService.com:8080/widget",
"method": "GET",
"version": "1.0",
"headers": [],
"credentials": {
"type": "oauth",
"clientId": "secret",
"clientSecret": "secret"
}
}
],
581
582
580

FIG. 5I

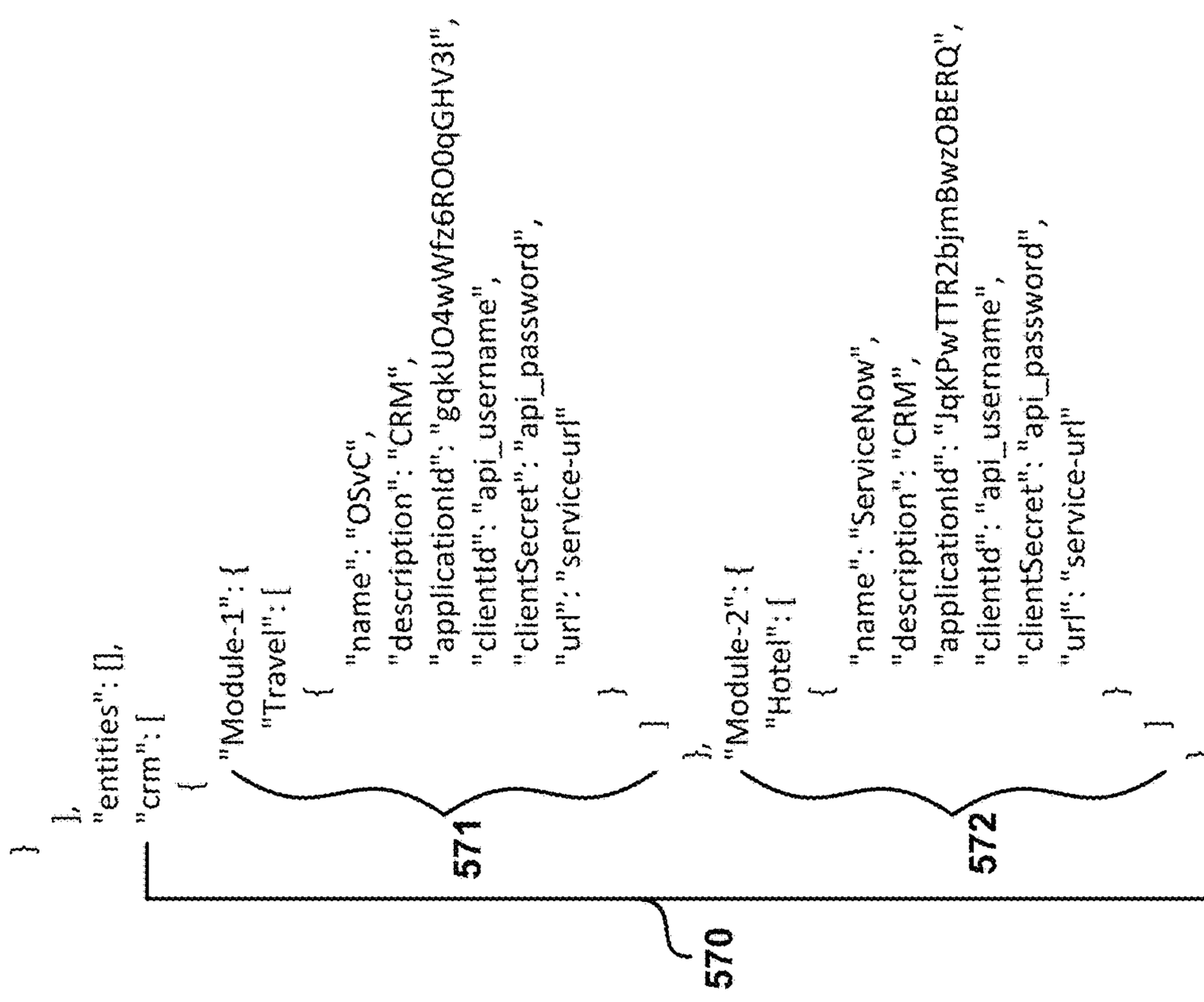

"entities": [],
"crm": [
{
"Module-1": {
"Travel": [
{
"name": "OSvC",
"description": "CRM",
"applicationId": "gqkUO4wWfz6ROOqGHV3I",
"clientId": "api_username",
"clientSecret": "api_password",
"url": "service-url"
}
]
},
"Module-2": {
"Hotel": [
{
"name": "ServiceNow",
"description": "CRM",
"applicationId": "JqKPwTTR2bjmBwzOBERQ",
"clientId": "api_username",
"clientSecret": "api_password",
"url": "service-url"
}
]
}
}
],
571
572
570

FIG. 5H

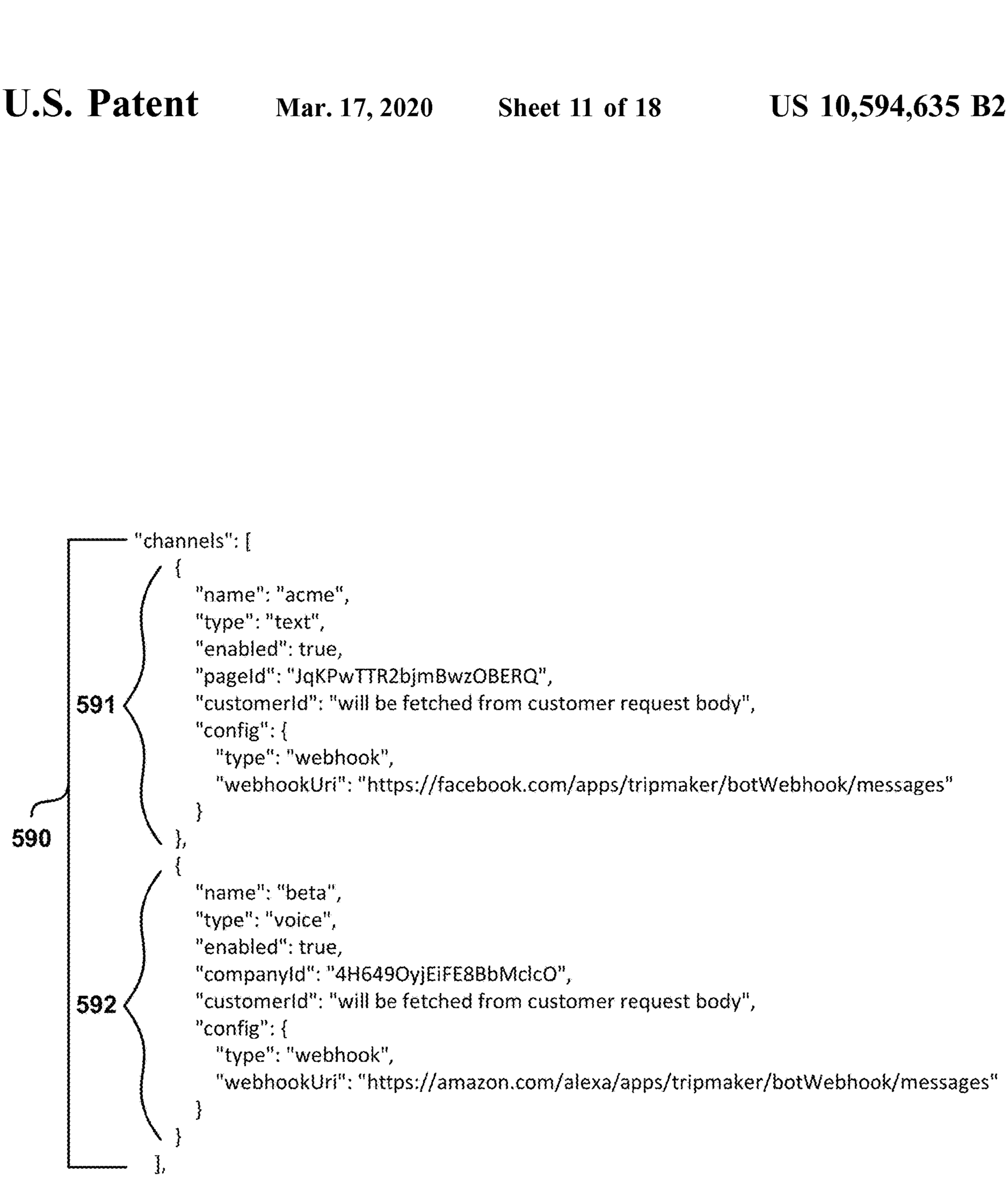

"channels": [
{
"name": "acme",
"type": "text",
"enabled": true,
"pageId": "JqKPwTTR2bjmBwzOBERQ",
"customerId": "will be fetched from customer request body",
"config": {
"type": "webhook",
"webhookUri": "https://facebook.com/apps/tripmaker/botWebhook/messages"
}
},
{
"name": "beta",
"type": "voice",
"enabled": true,
"companyId": "4H649OyjEiFE8BbMclcO",
"customerId": "will be fetched from customer request body",
"config": {
"type": "webhook",
"webhookUri": "https://amazon.com/alexa/apps/tripmaker/botWebhook/messages"
}
}
],
591
592
590

FIG. 5J

FIG. 6A

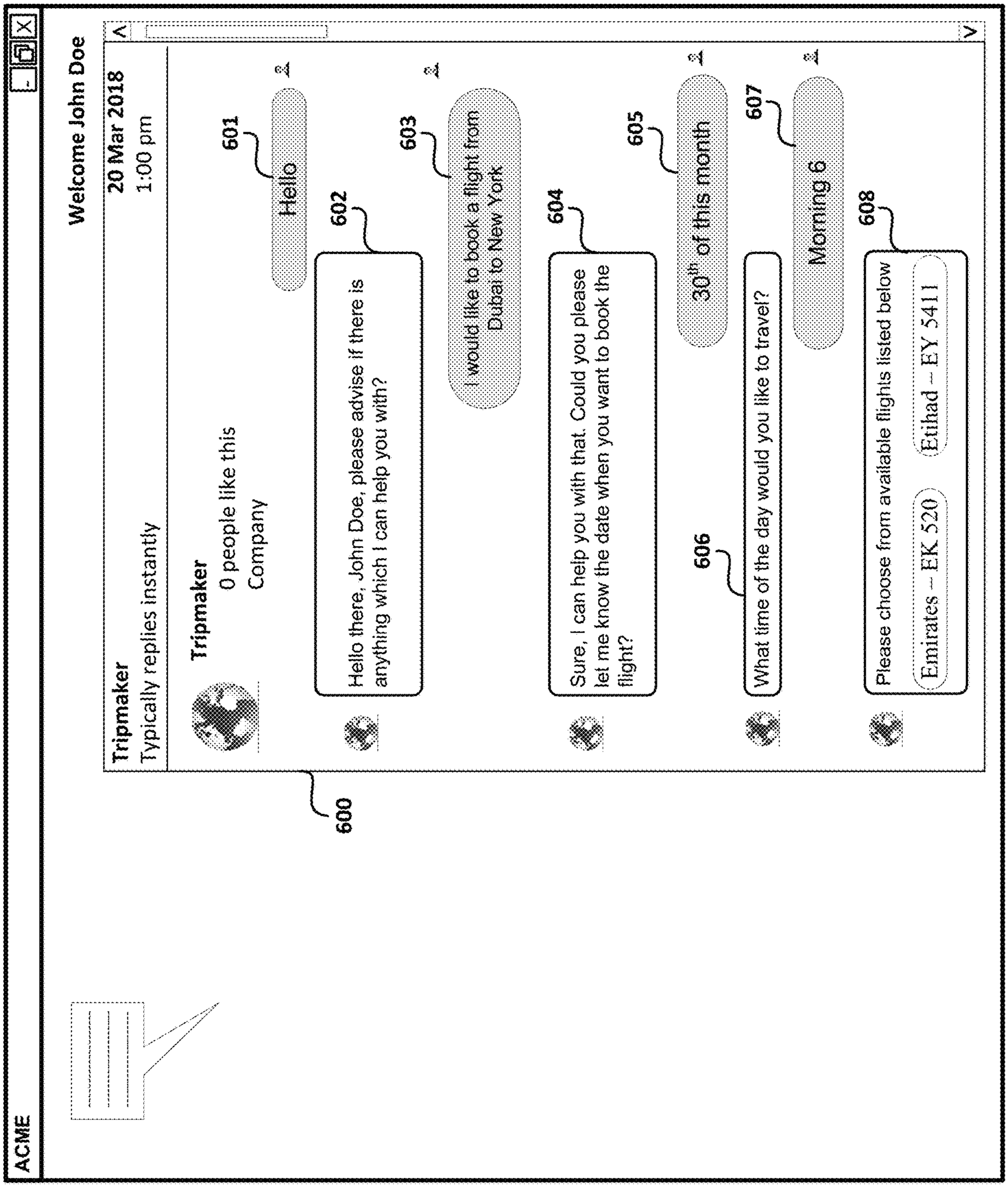
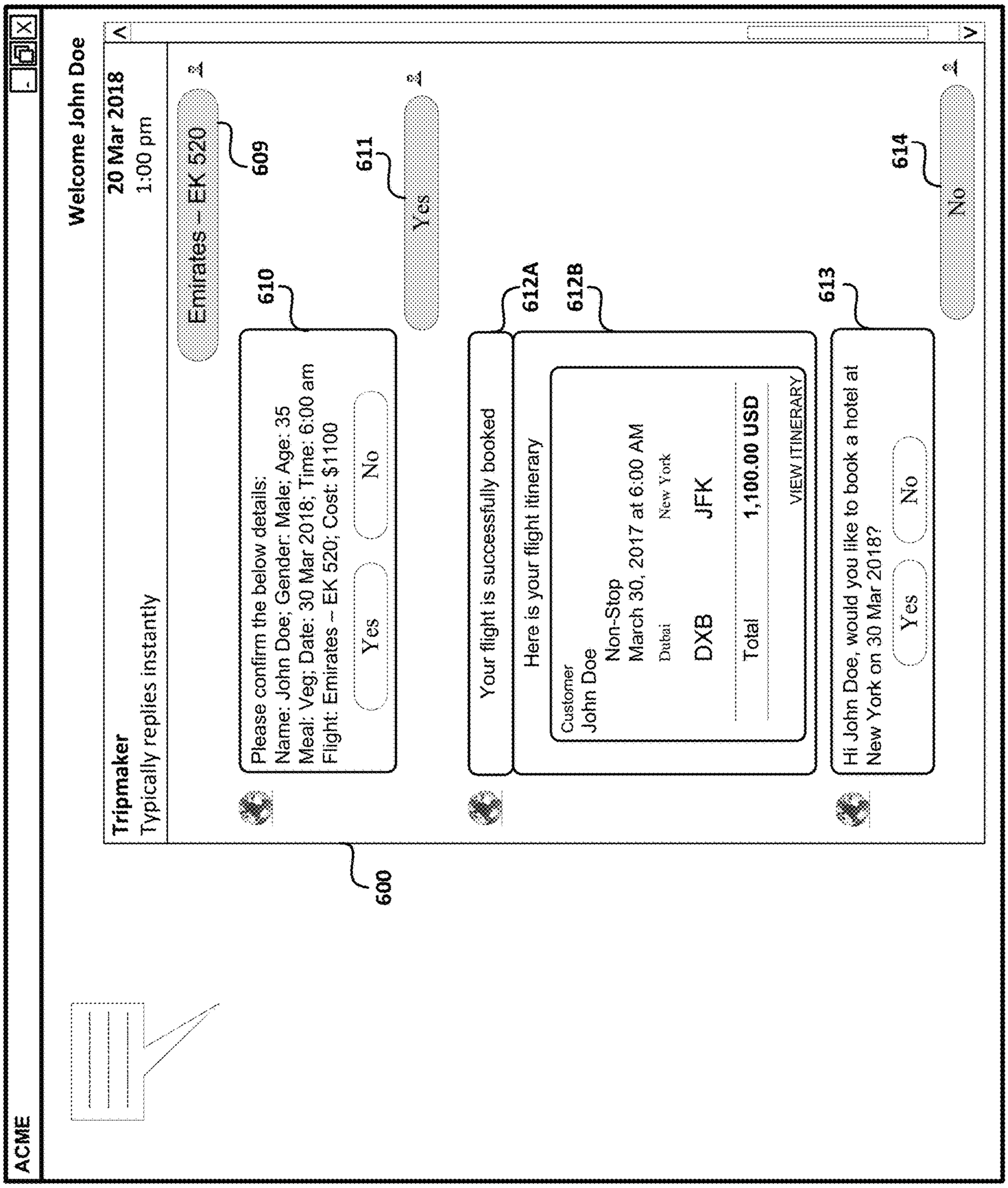

Welcome John Doe
20 Mar 2018
1:00 pm
Tripmaker
Typically replies instantly
Tripmaker
0 people like this
Company
600
601
Hello
602
Hello there, John Doe, please advise if there is anything which I can help you with?
603
I would like to book a flight from Dubai to New York
604
Sure, I can help you with that. Could you please let me know the date when you want to book the flight?
605
30th of this month
606
What time of the day would you like to travel?
607
Morning 6
608
Please choose from available flights listed below
Emirates – EK 520
Etihad – EY 5411
ACME

FIG. 6B


ACME
Welcome John
Tripmaker
Typically replies instantly
20 Mar 2018
1:00 pm
Emirates – EK 520
609
Please confirm the below details:
Name: John Doe; Gender: Male; Age: 35
Meal: Veg; Date: 30 Mar 2018; Time: 6:00 am
Flight: Emirates – EK 520; Cost: $1100
610
Yes
No
611
Yes
Your flight is successfully booked
612A
Here is your flight itinerary
612B
Customer
John Doe
Non-Stop
March 30, 2017 at 6:00 AM
Dubai
New York
DXB
JFK
Total
1,100.00 USD
VIEW ITINERARY
613
Hi John Doe, would you like to book a hotel at New York on 30 Mar 2018?
Yes
No
614
No
600

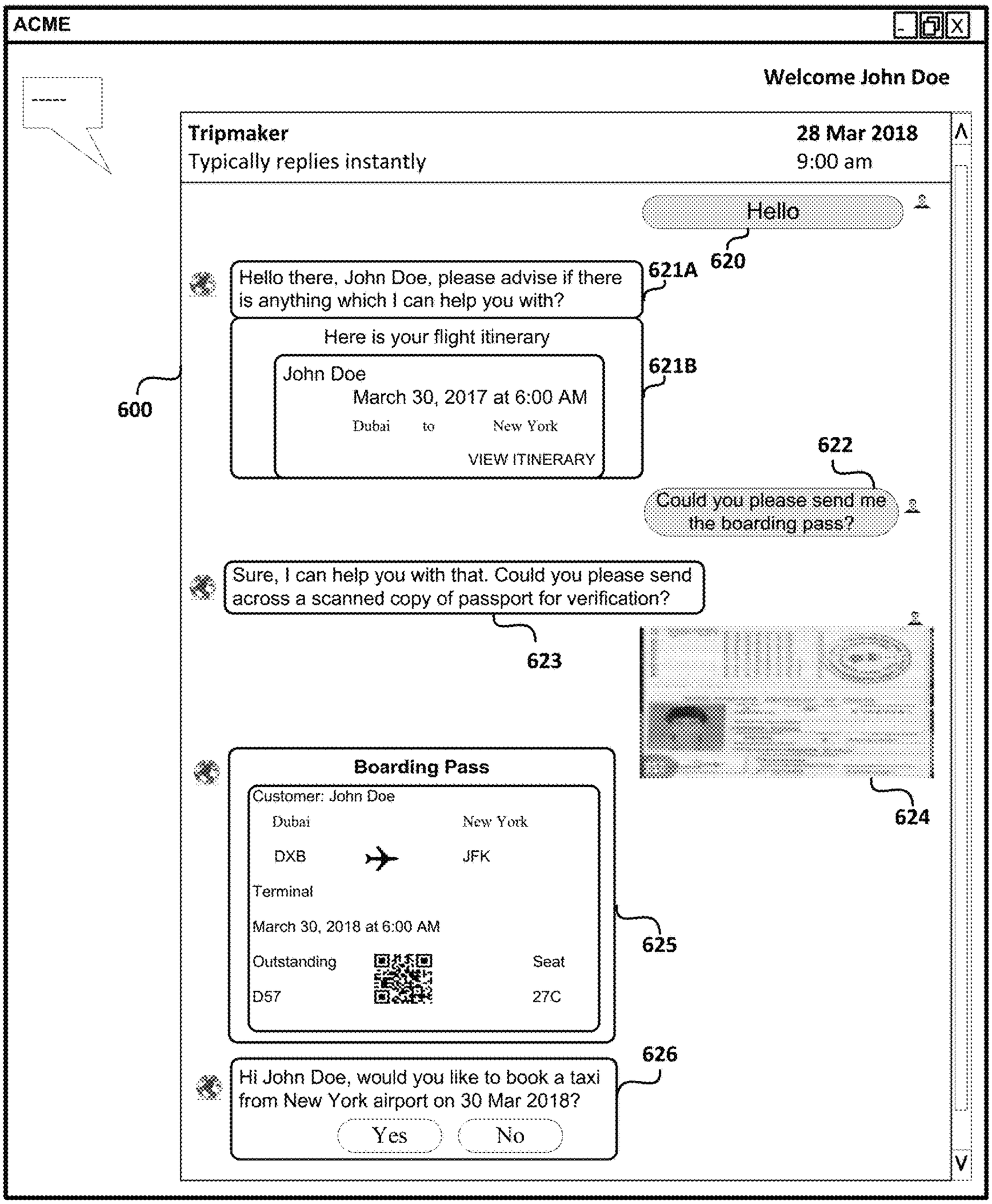

ACME
Welcome John Doe
Tripmaker
Typically replies instantly
28 Mar 2018
9:00 am
Hello
620
Hello there, John Doe, please advise if there is anything which I can help you with?
621A
Here is your flight itinerary
John Doe
March 30, 2017 at 6:00 AM
Dubai to New York
VIEW ITINERARY
621B
600
622
Could you please send me the boarding pass?
Sure, I can help you with that. Could you please send across a scanned copy of passport for verification?
623
624
Boarding Pass
Customer: John Doe
Dubai
New York
DXB
JFK
Terminal
March 30, 2018 at 6:00 AM
Outstanding
Seat
D57
27C
625
626
Hi John Doe, would you like to book a taxi from New York airport on 30 Mar 2018?
Yes
No

FIG. 6C

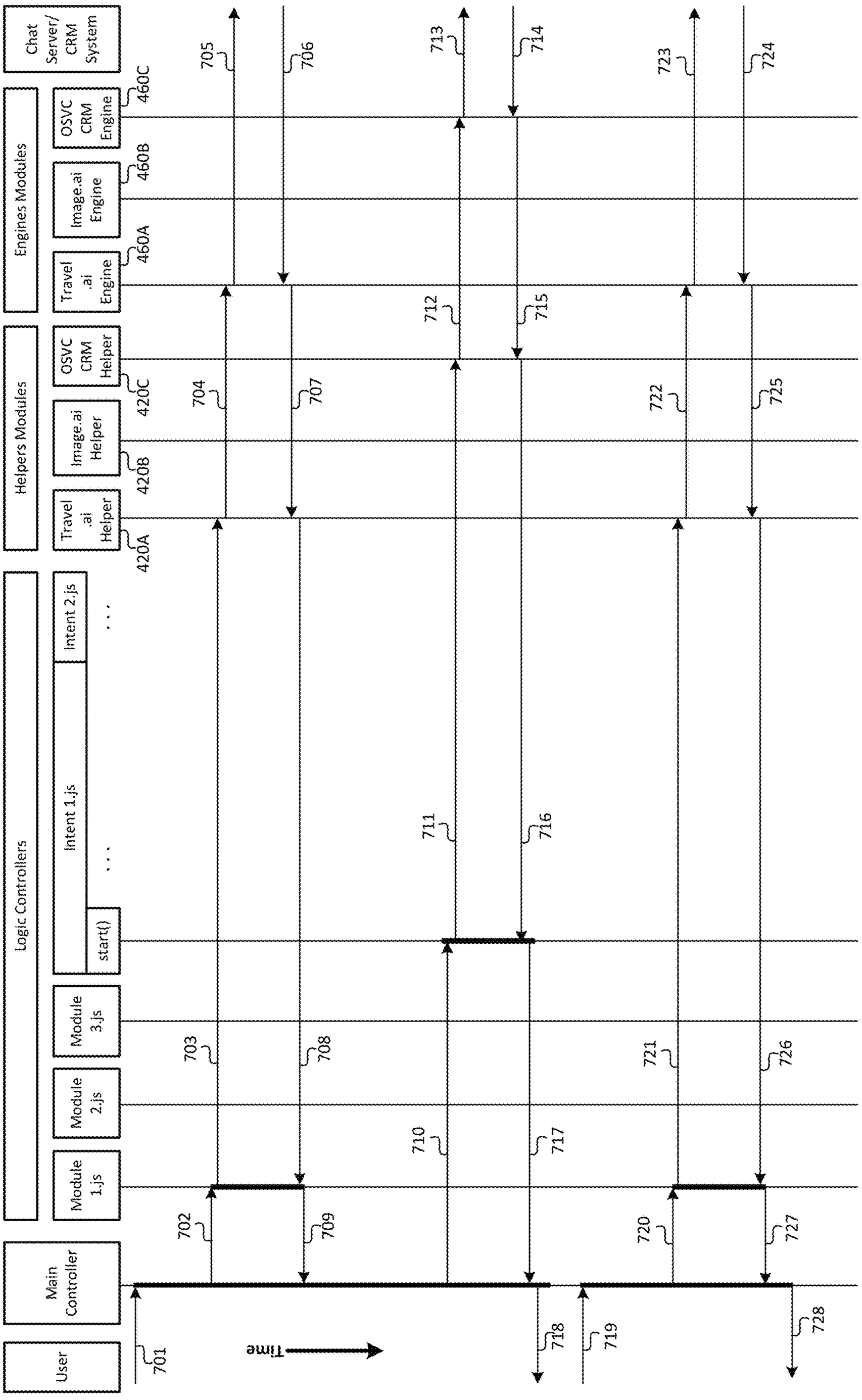

User
Main Controller
Logic Controllers
start()
Intent 1.js
Intent 2.js
Module 1.js
Module 2.js
Module 3.js
Helpers Modules
Travel .ai Helper
Image.ai Helper
OSVC CRM Helper
Engines Modules
Travel .ai Engine
Image.ai Engine
OSVC CRM Engine
Chat Server/ CRM System
Time
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728

FIG. 7A

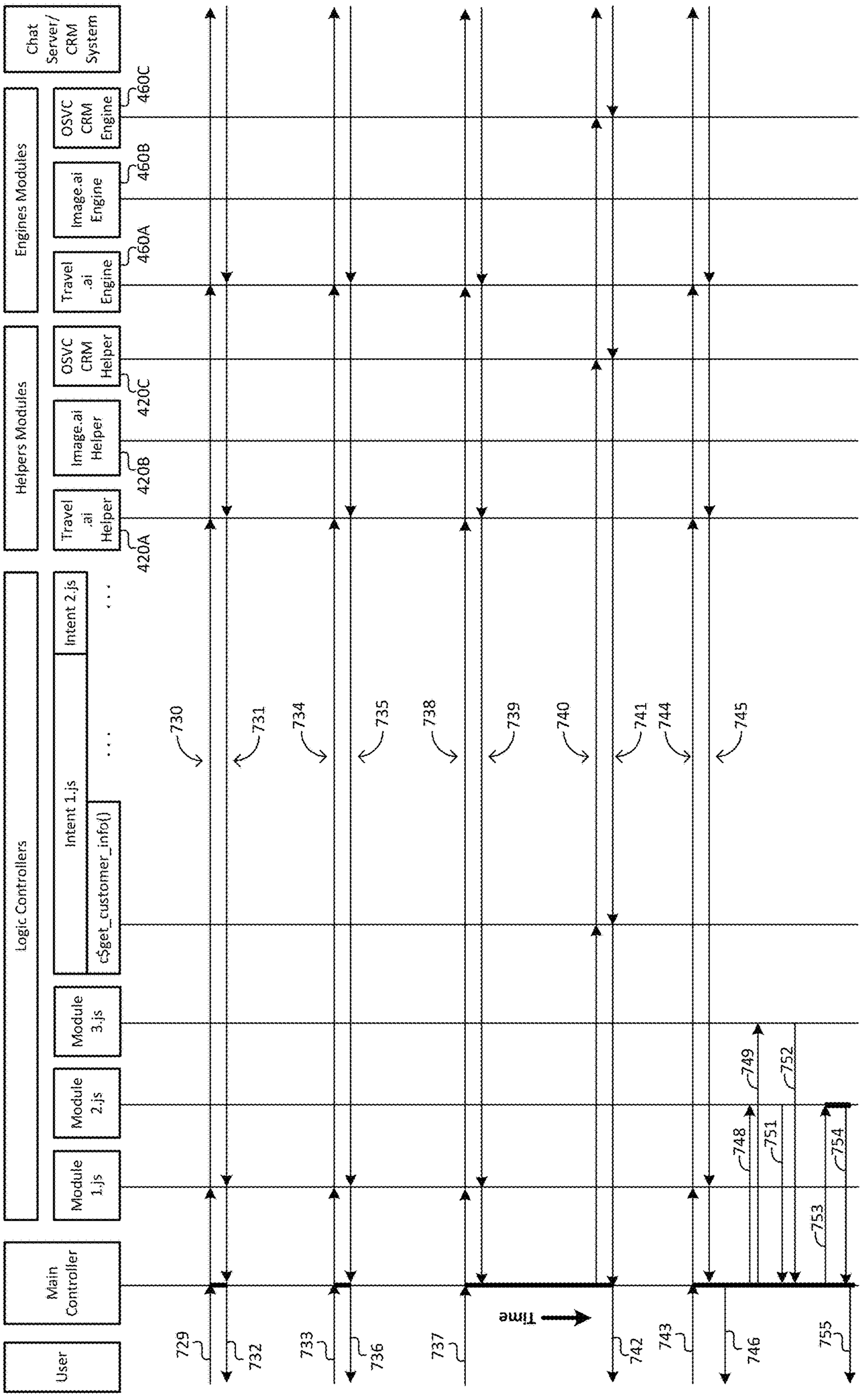

User
Main Controller
Logic Controllers
c$get_customer_info()
Intent 1.js
Intent 2.js
Module 1.js
Module 2.js
Module 3.js
Engines Modules
Travel .ai Engine
Image.ai Engine
OSVC CRM Engine
Chat Server/ CRM System
460A
460B
460C
Helpers Modules
Travel .ai Helper
Image.ai Helper
OSVC CRM Helper
420A
420B
420C
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
748
749
751
752
753
754
755
Time

FIG. 7B

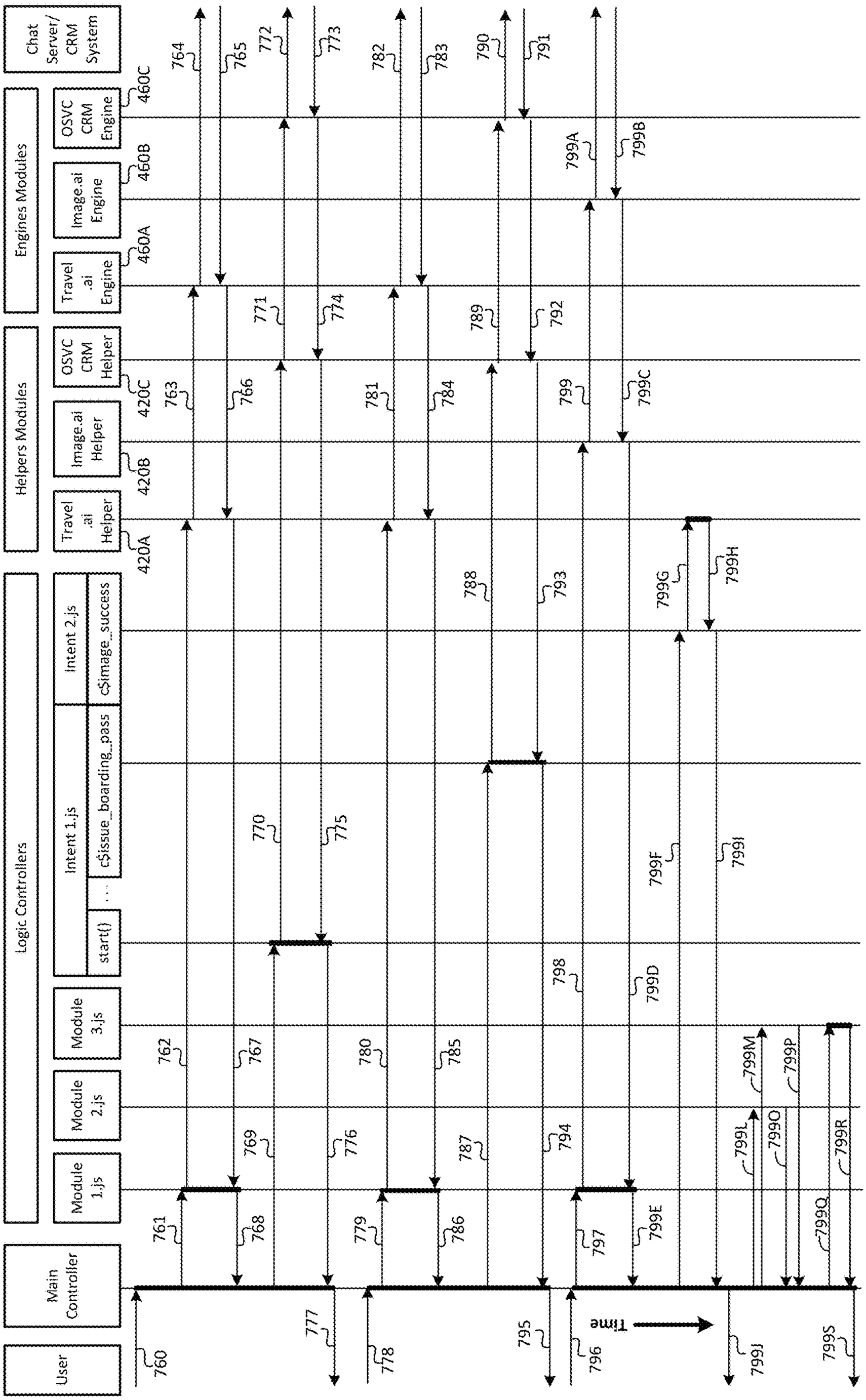

User
Main Controller
Logic Controllers
Module 1.js
Module 2.js
Module 3.js
Helpers Modules
Travel .ai Helper
Image.ai Helper
OSVC CRM Helper
Engines Modules
Travel .ai Engine
Image.ai Engine
OSVC CRM Engine
Chat Server/ CRM System
start()
Intent 1.js
c$issue_boarding_pass
Intent 2.js
c$image_success
Time

FIG. 7C

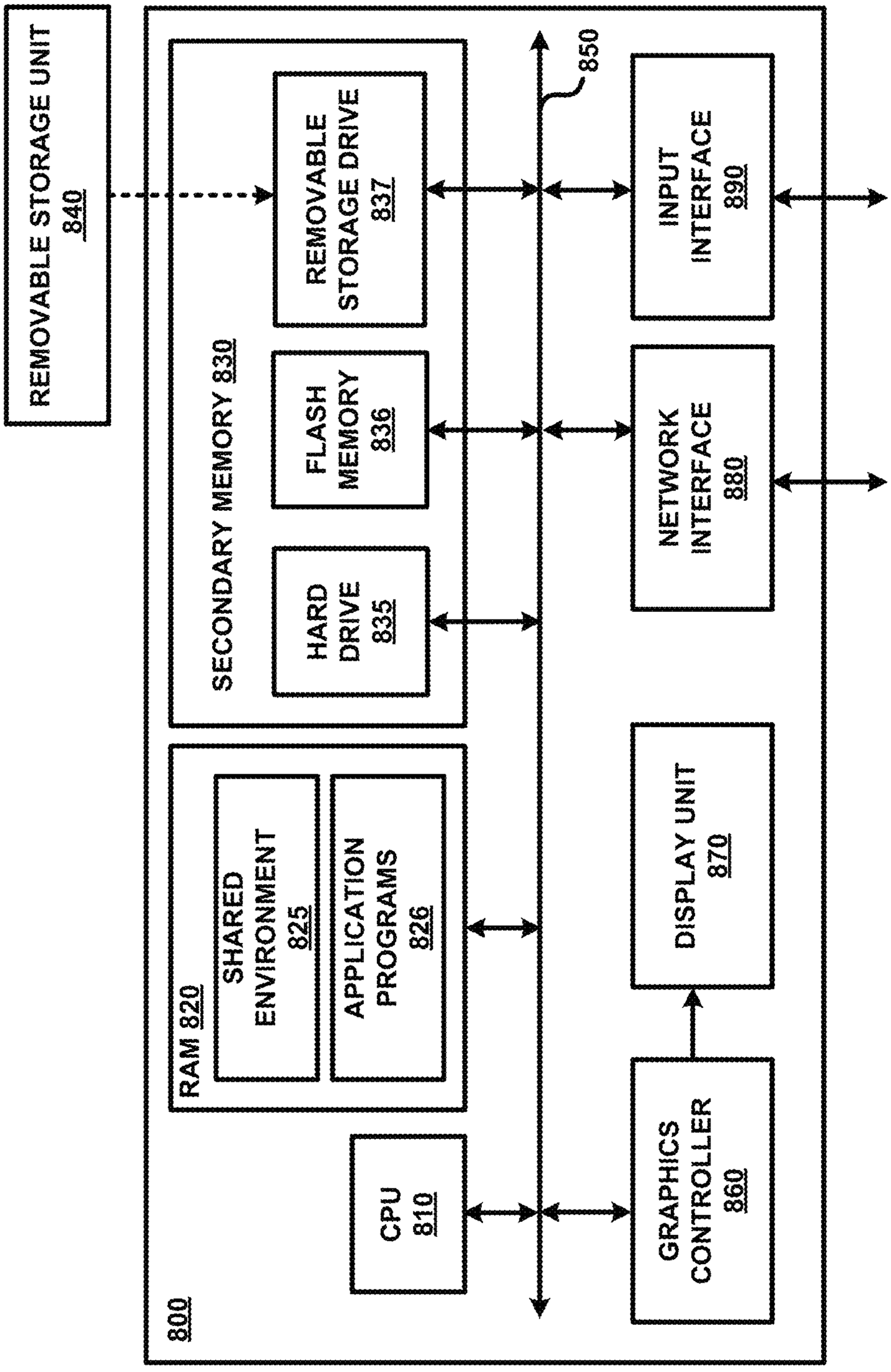

800
CPU 810
RAM 820
OPERATING SYSTEM
SHARED ENVIRONMENT 825
APPLICATION PROGRAMS 826
SECONDARY MEMORY 830
HARD DRIVE 835
FLASH MEMORY 836
REMOVABLE STORAGE DRIVE 837
REMOVABLE STORAGE UNIT 840
850
GRAPHICS CONTROLLER 860
DISPLAY UNIT 870
INPUT INTERFACE 890
NETWORK INTERFACE 880

FIG. 8

MANAGING CUSTOMER RELATIONSHIP USING MULTIPLE CHAT SERVERS DESIGNED TO INTERFACE WITH SERVICE APPLICATIONS

BACKGROUND OF THE DISCLOSURE

Technical Field

The present disclosure relates to customer relationship management (CRM), and more specifically to managing customer relationship using multiple chat servers designed to interface with service applications.

Related Art

A chat server is generally accessible on networks such as world-wide-web (WWW) and operates based on inputs in formats similar to natural language. In a common scenario, a chat server receives inputs from an end user (human being) and provides corresponding responses in an interactive fashion. Chat servers may employ technologies such as artificial intelligence in forming the respective responses, as is also well known in the relevant arts.

Chat servers are often designed to interface with service applications, typically for providing enhanced functionality or convenient user interfaces for the end users. Examples of service applications include travel applications, weather applications, hotel booking applications, etc.

In a common scenario, a chat server invokes the services provided by appropriate service application, depending on the specific context within the interactive dialogue with the end user. For example, if an end user engages in an online chat conversation with reference to travel, the chat server may use the services of service applications related to travel, weather, etc., to serve the end user.

Aspects of the present disclosure are directed to managing customer relationship using multiple chat servers designed to interface with service applications.

BRIEF DESCRIPTION OF THE DRAWINGS

Example embodiments of the present disclosure will be described with reference to the accompanying drawings briefly described below.

FIG. **1**A is a block diagram illustrating an example environment in which several aspects of the present disclosure can be implemented.

FIG. **1**B is a block diagram illustrating a prior approach in which an end user interfaces with multiple chat servers.

FIG. **2** is a block diagram illustrating some features of the present disclosure in an example embodiment.

FIG. **3** is a flow chart illustrating the manner in which customer (end user) relationship is managed using multiple chat servers according to an aspect of the present disclosure.

FIG. **4** is a block diagram illustrating the internal architecture of an interfacing unit according to an embodiment of the present disclosure.

FIGS. **5**A-**5**J together depict a sample configuration data implemented in the interface unit in one embodiment.

FIGS. **6**A-**6**C depict sample user interfaces in one embodiment of the present disclosure.

FIG. **7**A-**7**C depicts events at each stage corresponding to the user interface experience of FIGS. **6**A-**6**C.

FIG. **8** is a block diagram illustrating the details of digital processing system in which various aspects of the present disclosure are operative by execution of appropriate executable modules.

In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The drawing in which an element first appears is indicated by the leftmost digit(s) in the corresponding reference number.

DETAILED DESCRIPTION OF THE EMBODIMENTS OF THE DISCLOSURE

1. Overview

An interfacing unit provided according to an aspect of the present disclosure facilitates a user to be serviced based on multiple chat servers in a single chat session. In an embodiment, the interfacing unit receives a request on a chat session for a chat conversation from a user, identifies a first suitable chat server for the chat conversation, and forwards a first sequence of inputs received from the end user on the chat session to the first suitable chat server. The messages generated as a result are forwarded back to the end user as corresponding responses. The interfacing unit then forwards a received second sequence of inputs to a second chat server to receive a second sequence of messages corresponding to the second sequence of inputs. The interfacing unit forwards the second sequence of messages as respective responses to the second sequence of inputs.

According to another aspect of the present disclosure, the operation of the interfacing unit is controlled by configuration data that can be configured by an administrator. In an embodiment, the configuration data indicates a respective set of chat servers available for each broad purpose of a multiple broad purposes. Each of the first sequence of inputs and the second sequence of inputs is encapsulated in a respective network packet with a destination field indicating that the network packet terminates at the interfacing unit. Each of the first sequence of messages and the second sequence of messages is encapsulated in a respective packet with a source field indicating that the packet originates at the interfacing unit. The configuration data indicates that first chat server and the second chat server are contained in a first set of chat servers for a first broad purpose. The interfacing unit examines the configuration data to determine that the first sequence of inputs is to be forwarded to the first chat server and that the second sequence of inputs is to be forwarded to the second chat server.

According to one more aspect of the present disclosure, the configuration data further indicates a respective action required for each intent of a respective multiple intents manifested in chat conversations. The interfacing unit may determine a sequence of current intents manifested at corresponding time instances in the chat conversation, and a respective action to be performed for each current intent by examining the configuration data. The interfacing unit may perform the determined corresponding action.

According to another aspect, each of the inputs and the messages is according to natural language, wherein the inputs are forwarded to the set of chat servers in natural language and the messages are received from the set of chat servers also in natural language. In an embodiment, each intent is provided by the corresponding chat server along with the response packet. In another embodiment, the switch from the first chat server to the second chat server is based on an entry in the configuration data.

According to another aspect, upon completion of processing of a first purpose, the interfacing unit forwards, to each of the set of chat servers, a set of metadata representing a current state of the chat transaction as a part serving the first purpose. The interfacing unit determines a set of suitable

chat servers depending on the respective responses received from each of the set of chat servers, and sets one of the set of suitable chat servers as the second chat server.

Several aspects of the present disclosure are described below with reference to examples for illustration. However, one skilled in the relevant art will recognize that the disclosure can be practiced without one or more of the specific details or with other methods, components, materials and so forth. In other instances, well-known structures, materials, or operations are not shown in detail to avoid obscuring the features of the disclosure. Furthermore, the features/aspects described can be practiced in various combinations, though only some of the combinations are described herein for conciseness.

2. Example Environment

FIG. **1**A is a block diagram illustrating an example environment in which several aspects of the present disclosure can be implemented. The block diagram is shown containing client systems **110**A-**110**M (where M can be any positive integer), web servers **120**A-**120**N (where N can be any positive integer), communication network **125** and cloud infrastructure **135**. Cloud infrastructure **135** in turn is shown containing CRM Systems **130**A-**130**Q (where Q can be any positive integer), Custom Service Providers **145**A-**145**S (where S can be any positive integer) and chat servers **140**A-**140**P (where P can be any positive integer).

Merely for illustration, only representative number/type of systems is shown in FIG. **1**A. Many environments often contain many more systems, both in number and type, depending on the purpose for which the environment is designed. Each block of FIG. **1** is described below in further detail.

Communication network **125** represents a network providing connectivity between web servers **120**A-**120**N, client systems **110**A-**110**M and cloud infrastructure **135**. Communication network **125** may be an internet (including the world-wide connected Internet), a combination of internet and intranet, etc. Communication network **125** may be implemented using protocols such as Transmission Control Protocol (TCP) and/or Internet Protocol (IP), well known in the relevant arts.

In general, in TCP/IP environments, a TCP/IP packet is used as a basic unit of transport, with the source address being set to the TCP/IP address assigned to the source system from which the packet originates and the destination address set to the TCP/IP address of the target system to which the packet is to be eventually delivered. An IP packet is said to be directed to a target system when the destination IP address of the packet is set to the IP address of the target system, such that the packet is eventually delivered to the target system by communication network **125**. When the packet contains content such as port numbers, which specifies a target application, the packet may be said to be directed to such application as well.

Each of the client systems **110**A-**110**M represents a system such as a terminal, personal computer, workstation, mobile device, computing tablet, etc., used by users to interface with chat servers **140**A-**140**P and CRM systems **130**A-**130**Q. The chats with chat servers are in 'natural language' implying the corresponding content is represented in ways humans normally converse with each other using languages such as English, German, French, Spanish, Hindi and Kannada.

In relation to chats, the interface may be realized using IP packets, with the packets from the client system being directed to the chat servers at respective chat server, and the packets from the chat servers being directed to the respective client system. Similarly, IP packets may be used for interfacing with CRM systems as well, but according to suitable interfaces for the corresponding interactions.

Each of web servers **120**A-**120**N represents a server, such as a web/application server, providing services to external systems. In the illustrative embodiments, web servers **120**A-**120**N are assumed to implement various travel related services such as flight reservations, hotel bookings, taxi reservations, etc., accessed by chat servers, though the web servers can implement and provide any services as suitable in corresponding environments.

Cloud infrastructure **135** is shown hosting customer relationship management (CRM) systems **130**A-**130**Q and chat servers **140**A-**140**P. Cloud infrastructure **135** generally enables ubiquitous access over the internet to shared pools of CRM systems **130**A-**130**Q and chat servers **140**A-**140**P as is well known in the relevant arts.

Chat servers **140**A-**140**P implement chat servers, which enable user interactions in natural language. Thus, each chat server receives inputs in natural language and generates outputs also in natural language. The generated outputs (in natural language) are forwarded to corresponding client systems.

CRM systems **130**A-**130**Q represent conventional systems that formally complement the management of customer (end user) relationship. Each CRM system is typically used for maintaining identities and contact information of various customers (end users) and for managing customer interactions with respect to any purchases, subscriptions, problems or marketing efforts.

Custom service providers **145**A-**145**S are publicly available web services that are accessible over the internet. Some of the exemplary custom service providers are weather prediction services, map services, etc.

The description is continued with respect to the manner in which an end user may use chat servers and a problem with such an approach.

3. Prior Approach

FIG. **1**B is a block diagram illustrating a prior approach in which an end user interfaces with multiple chat servers. The block diagram is shown as containing end user **150**, chat servers **160**A-**160**C and utility servers **170**A-**170**C.

In the prior approach, a chat server is configured to interact with one or more utility servers and provide responses to end user **150** (from one of client systems **110**A-**110**M). Utility servers are web applications providing services to end users. For instance, utility servers may include web applications providing travel booking services, hotel booking services, weather update services.

As an example, chat server 1 **160**A is shown interfacing with two utility servers namely travel server **170**A and hotel server **170**B. Accordingly, chat server 1 **160**A is configured to provide end user **150** at least with information on both travel booking and hotel booking services.

Similarly, chat server 2 **160**B is shown interfacing with one server namely hotel server **170**B. Accordingly, chat server 2 **160**B is configured to provide end user **150** with only hotel booking services.

In a similar manner, chat server 3 **160**C is shown interfacing with one server namely weather server **170**C. Therefore, chat server 3 **160**C is configured to provide end user **150** with only weather forecast services.

There are several challenges involved in such a prior approach. One challenge is that a single chat server configured to interface with one or more utility servers may not be able to cater to the requirements of the user. For example, chat server 1 **160**A provided by a vendor configured to

interface with travel services and hotel services may not be able to cater to the requirement of providing weather forecast services. Similarly, chat server 3 **160**C provided by another vendor configured to interface with weather forecast server **170**C may not be able to provide either hotel services or travel services. In other words, prior approach fails to provide a solution for integrating multiple chat servers provided by different vendors. Yet another challenge is that the prior approach lacks integration of chat servers with customer relationship management (CRM) application systems. Another challenge in the prior approach is the lack of integration between the chat servers. In other words, chat server 1 **160**A does not share any metadata with either chat server 2 **160**B and/or chat server 3 **160**C during a chat conversation and accordingly does not generate additional options that may be of interest to the user but not part of the user request.

Aspects of the present disclosure provide an approach to manage customer relationship using multiple chat servers designed to interface with service applications.

4. Block Diagram of an Example Embodiment

FIG. **2** is a block diagram illustrating some features of the present disclosure in an example embodiment. The block diagram is shown containing end user **150**, interfacing unit **250**, chat servers **260**A-**260**P, CRM systems **280**A-**280**Q, and custom service providers **270**A-**270**S.

End user **150** interacts with interfacing unit **250** using chat clients. Exemplary chat clients include Facebook Messenger™, Whatsapp™, Line™ and WeChat™. The interaction between end user **150** and interfacing unit **250** is a two-way communication as represented by **245**.

Each of the chat servers **260**A-**260**P may operate similar to chat servers **160**A-**160**C, and interface with various services in the backend (though not shown). In other words, each chat server **260**A-**260**P receives inputs in natural language on respective path **256**A-**256**P, uses (invokes) the services provided by utility servers **170**A-**170**C as appropriate, and generates responses on corresponding one of paths **256**A-**256**P also in natural language. In the following description, each of chat servers **260**A-**260**P is implemented as a chat bot (for example, DialogFlow product) or as an AI (Artificial Intelligence) enabled processing engine (for example, Clarifai application, well known in the relevant arts), and accordingly is capable of providing automated responses in natural language. In addition, each of chat servers **260**A-**260**P is also capable of providing additional information ("intents", explained below) as part of the responses.

Though not shown, each chat server may be capable of providing chat sessions to end users directly, without the packet content traversing interfacing unit **250**. The input/output interfacing may be akin to that with the packets received/sent on paths **256**A-**256**P in such situations as well.

Each of the Custom Service Providers **270**A-**270**S provides publicly available web services over the internet in a similar manner as that of Custom Service Providers **145**A-**145**S. Each of the CRM systems **280**A-**280**Q manages customer (end user) relationship in a similar manner as that of CRM systems **130**A-**130**Q.

Interfacing unit **250** provided according to an aspect of the present disclosure, interfaces with more than one chat server (when needed) in providing responses to end user **150** in a single chat session. A single chat session is characterized by a sequence of messages (in either direction) displayed in a corresponding single window in a seamless manner (i.e., with the user not being required to take any action to switch between the chat servers). The sequence of messages depicts the user inputs and the corresponding responses (from chat servers) as in a conversation. Each message is assumed to be contained in one packet (with the corresponding TCP/IP headers).

Thus, interfacing unit **250** is able to take advantage of service capabilities of any of the chat servers in interacting with end users. Interfacing unit **250** may interact with chat server 3 having the interfacing ability with weather server **170**C as well as chat server 1 having the interfacing ability with travel server **170**A and hotel server **170**B, for the purpose of providing a response on a single chat session to a single end user (client system). The problem(s) noted with respect to FIG. **1**B above may be solved at least for such a reason.

Each user input can be a single message or a set of messages. In an embodiment, assuming user input to be a single message, the single message may be processed by multiple systems (for instance by any of chat servers **260**A-**260**P, any of CRM systems **280**A-**280**Q and/or any of custom service providers **270**A-**270**S) to provide a response from the multiple systems. In other words, one or more chat servers, CRM systems and/or custom service providers can seamlessly process a single user input to generate respective messages, which are all provided as a response to the single user input.

In an embodiment, packets from client system **110**A-**110**M are directed to interfacing unit **250** (in one direction), which in turn forwards the content to an appropriate chat server. Interfacing unit **250** constructs packets based on the message responses from the corresponding chat servers, and forwards such constructed packets back to the requesting client system (end user **150**) in the reverse direction. The packets in the reverse direction originate at interface unit **250** (according to IP Protocol) and terminate at client system **110**A-**110**M. However, alternative embodiments can be implemented using other approaches, as will be apparent to one skilled in the relevant arts by reading the disclosure provided herein.

In a further embodiment, the operation of interfacing unit **250** is controlled using administrator definable/configurable rules, which simplifies the integration of additional chat servers suitable in corresponding contexts. The description is continued with respect to such a rule based implementation of interfacing unit **250**.

4. Rule Based Interfacing Unit

FIG. **3** is a flow chart illustrating the manner in which customer relationship is managed using multiple chat servers (designed to interface with servers) according to an aspect of the present disclosure. The flowchart is described with respect to interfacing unit **250** and chat servers **260**A-**260**P of FIG. **2** merely for illustration. However, many of the features can be implemented in other environments also without departing from the scope and spirit of several aspects of the present invention, as will be apparent to one skilled in the relevant arts by reading the disclosure provided herein.

The flow chart begins in step **301**, in which control immediately passes to step **310**. In step **310**, interfacing unit **250** maintains configuration data indicating the chat servers available for each broad purpose, and the action that needs to be taken when a specific intent is identified for messages from end users in chat conversations in that broad purpose. A broad purpose refers to a broad service/utility (available from a single service provider) that may be of interest to end users. Each broad purpose may be travel booking purpose, hotel booking purpose, taxi booking purpose, etc. Each

broad purpose is shown implemented by a corresponding utility server **170**A-**170**C in FIG. **1**B.

An intent represents an identifiable state of the chat conversation on which the end user is currently interfacing with chat servers (via interfacing unit **250**). Based on the intent identified by interfacing unit **250**, a corresponding action may be triggered. In an embodiment described below, the "intent" is determined by chat servers and communicated to interfacing unit **250**. In the absence of intent communicated by chat servers **260**A-**260**P, the intent is referred to as a 'blank intent' for the sake of brevity. The configuration data indicates the action required for each of such intents in the context of chats for corresponding purposes. The intent can be determined based on various approaches (implemented in chat servers, interfacing unit and/or external systems), even though the embodiment(s) described below rely on unique intent keys that are communicated from the chat servers for this purpose.

In step **320**, interfacing unit **250** receives a request for a chat conversation from end user **150** in natural language. The request may specify a broad purpose as well. In step **340**, interfacing unit **250** examines configuration data to determine an appropriate chat server to which the control is to be transferred. Interfacing unit **250** may accordingly choose one of the chat servers that is indicated in the configuration data as having the service capability corresponding to the broad purpose specified in the request.

In step **350**, control is transferred to the determined chat server. Transferring control implies that interfacing unit **250** thereafter transfers each received input on the chat conversation to the determined chat server and receives the corresponding response. Interfacing unit **250** forwards each response of the chat conversation to the same client system (end user) from which the request is received.

In step **360**, interfacing unit **250** determines an intent manifested in the conversation. The intent is determined by examining the requests/responses on the conversation. Technologies such as Artificial Intelligence (AI) may be used for such a purpose, even though embodiments described below depend on the intent states generated by the chat servers. Examples of intent are shown in the configuration data described in sections below.

In step **370**, interfacing unit **250** identifies the action that needs to be taken when a specific intent is communicated based on the configuration data. The action is thereafter executed in steps **380** and **390** as described below.

In step **380**, interfacing unit **250** checks whether the determined action is to conclude the conversation. In that case, control is transferred to step **399**, in which the flowchart ends. Otherwise, control passes to step **390**.

In step **390**, interfacing unit **250** performs the identified action and then the control transfers to step **360**. Such action can be to transfer control to some other chat server as well, which implies that the interfacing unit **250** is able to use as many different chat servers as needed in the same chat session (as experienced by the end user, typically in the corresponding single window established for the chat session). Similarly, as noted above, multiple messages can be generated (each from a different chat server) as a response to a single message, by appropriate choice of configuration data.

The features described above can be implemented using different approaches in corresponding embodiments. The description is continued with respect to the details of an example embodiment.

5. Example Internal Architecture of Interfacing Unit

FIG. **4** is a block diagram illustrating the details of interfacing unit **250** in an embodiment. Interfacing unit **250** is shown containing configuration data **405**, main controller **410**, logic controllers **440**A-**440**X, helper modules **420**A-**420**(P+Q), engine modules **460**A-**460**(P+Q). Each block is described below in further detail.

Configuration data **405** may be stored in one or more files and controls the operation of interfacing unit **250**. As will be clearer from the description below, the configuration data is editable and modifiable, to be able to add or delete chat servers or CRM systems (as well as alter operation with respect to individual systems) for any of the broad purposes.

Main controller **410** transfers packets received on an incoming chat session to one of the logic controllers **440**A-**440**X (where X can be any positive integer) according to the configuration specified in configuration data **405**. When a chat session is initially established, the session is allocated to one of the logic controllers (and to a specific chat server) according to the configuration data. Main controller **410** similarly receives packets from the allocated logic controller and forwards the packets to communications network **125** to cause the packet to be delivered to the corresponding client system. Main controller **410** accordingly maintains a chat session table indicating the logic controller and chat server to which a chat session is currently (at that point of time) allocated.

Main controller **410** also determines when a logic controller and/or chat server is to be changed for a session (prior to updating the chat session table), and orchestrates a change accordingly. In an embodiment, main controller **410** determines when/whether a change is required based on configuration data and current intent received associated with each response. When a change is determined to be necessary, main controller **410** forwards the current context of the chat session to each of logic controllers **440**A-**440**X, which forward such context to respective chat servers. Such context may be sent as a meta data representing the material data exchanged on the chat session thus far.

The responses from each chat server may be examined to determine the most eligible chat server to be such a next chat server. In an embodiment, each response from a chat server indicates a 'weight' value, based on which the extent of eligibility is determined. A chat server from which the highest value is received, may be selected as the most eligible chat server. The chat session table may accordingly be updated to seamlessly continue interactions for the user with the newly selected chat server.

Logic controllers **440**A-**440**X correspond to the X number of (different) broad purposes and implement any additional logic specific to the corresponding broad purpose. Thus, in the illustrative example, individual logic controllers may respectively be provided for travel, taxi, hotel, etc., reservations. In an embodiment, in case a logic controller has the choice of using more than one chat server for a given broad purpose, the logic controller determines the specific chat server or CRM system to use for the chat session and interfaces with the corresponding helper module for packets on that chat session.

Helper modules **420**A-**420**(P+Q) facilitate inclusion of customized logic in interactions between logic controllers and engine modules. The routine customized functions may include any needed data conversions (e.g., XML to PDF, etc.) and wrapper functions that facilitate compatibility with prior versions, etc.

Each engine module **460**A-**460**(P+Q) is designed to interface with a corresponding one of chat servers **260**A-**260**P

and CRM systems **280**A-**280**Q. Each engine module may strip the packet headers from a network packet received from communication network **125**, and append headers suitable for forwarding the resulting cloud packets to the corresponding chat server/CRM system. Each engine module may operate to provide any other packet/protocol compatibilities with the corresponding chat server/CRM system.

Similarly, when cloud packets are received from chat servers/CRM systems, the engine module repackages the received content in network packets suitable for delivery to corresponding client system. Accordingly, each engine module maintains a session mapping of TCP/IP session information on network **125** side and corresponding session information on cloud side, to implement the repackaging required in both directions.

In an embodiment, each chat server and CRM system responds back with a response content and intent for each input content of the user (forwarded to the chat server/CRM system). The intent also is passed to helper module for appropriate action according to aspects of the present disclosure. While the received intent is passed to helper module as a current intent, various techniques for determining such current intent, some based on persistence of state according to prior communication, will be apparent to one skilled in the relevant arts by reading the present disclosure. As noted above, the current intent is sent back to main controller **410**, which determines the further actions with respect to the associated (network) packet, etc.

It may thus be appreciated that configuration data **405** controls many actions performed by interfacing unit **250**. The description is accordingly continued with respect to sample configuration data in an example embodiment.

5. Sample Configuration Data

FIGS. **5**A-**5**J together depict a sample configuration data implemented in the interface unit in one embodiment. The configuration data is according to JSON Format described in further detail in a document entitled, "RFC 8259: The JavaScript Object Notation (JSON) Data Interchange Format", by T. Bray of Internet Engineering Task Force (IETF).

Broadly, the sample configuration data is defined entailing only three broad purposes namely travel, hotel and taxi booking services, for illustration. Additional portions of configuration data as suited for corresponding environments will be apparent to one skilled in the relevant arts by reading the disclosure provided herein.

Broadly, blocks **510**, **520**, **528**, **530**, **540**, **550** and **560** of FIGS. **5**A-**5**G respectively relate to controlling communications to chat servers **260**A-**260**C. Block **570** of FIG. **5**H relates to interfacing with CRM systems **258**A-**258**Q. Block **580** of Figure SI relates to interfacing with Custom Service Providers **270**A-**270**S. Block **590** of FIG. **5**J relates to various types of chat clients that can access interfacing unit **250** using client systems **110**A-**110**M. Each of the blocks is described in detail below.

Block **510** of FIG. **5**A indicates that the data portion relates to "Travel" purpose, and that there are two chat servers (travel.ai in sub-block **511** and image.ai in sub-block **512** of FIG. **5**A) that can be used for Travel purpose. Sub-block **513** of FIG. **5**A indicates a priority of 1, implying that travel module is to be used as the default module, compared to other modules with a higher priority number. Sub-block **514** indicates that "module1" logic controller (assumed to be Logic Controller **440**A) can be invoked by main controller **410** for travel reservations purpose.

Each of the blocks **511** and **512** of FIG. **5**A contains text indicating the name, description (the input format), application id, userid/password for the respective engine module to login and use the services provided by the chat server, the identifier of block for 'intents' expressed in the corresponding chat conversation, and the URL at which the chat server is deemed to be accessed by the chat clients.

The input format in block **511** of FIG. **5**A is shown to be nlp (natural language processing), while the input format in block **512** of FIG. **5**A is shown to be image. Lines **515** and **516** of FIG. **5**A respectively indicate the intents to be defined in sub-modules labeled as "intents_1" (for travel.ai) and "intents_2" (for image.ai). The two sub-modules are shown as blocks **530** of FIG. **5**D and **540** of FIG. **5**E respectively.

Block **530** of FIG. **5**D corresponding to "intents_1" (of line **515**) is shown containing five intents depicted in sub-blocks **531**-**535** of FIG. **5**D respectively. Each sub-block is shown containing header unique intent key (which is required to match the incoming intent from the chat server for the sub-block to be applicable), "name" of the function in the logic controller to be invoked, and weight. The weight is used as a threshold number (e.g., only if the received weight exceeds the stated weight) for invoking the named function.

Thus sub-block **531** is shown with header unique intent key of "START_INTENT", 'start' as the function to be invoked within the "intents_1" file (as indicated by line **515**), and 0.7 as the weight. The remaining sub-blocks **532**-**535** of block **530**, sub-blocks **541**-**542** of block **540**, sub-blocks of blocks **550** and **560** are similarly explained. Block **520** of FIG. **5**B and sub-blocks **521**-**524** of FIG. **5**B are explained similar to above and the description is not repeated in the interest of conciseness.

Continuing with respect to block **570** and **580** of FIGS. **5**H and **5**I respectively, sub-block **571** of FIG. **5**H depicts the CRM system that can be used for travel purpose, and sub-block **572** of FIG. **5**H depicts the CRM system that can be used for hotel purpose. Each of the sub-blocks is shown containing the name, description, applicationid, userid/password combination (to be used for logging-in).

Block **580** of Figure SI contains two sub-blocks **581** and **582** respectively showing the manner in which messages can be posted to and retrieved from Custom Service Providers (for example Custom Service Providers **270**A and **270**B) using REST/SOAP architecture.

Block **590** of FIG. **5**J contains two sub-blocks **591** and **592** for Acme and Beta as the text and voice chat clients respectively. Sub-block **591** indicates that the text chat client is to be provided as part of the Acme website/web pages. Each sub-block also indicates the credential/end point details necessary to communicate with the chat client.

The manner in which such configuration data is used in the architecture described above, is explained below with an example.

6. Sample Transactions of a Single Chat Session

FIGS. **6**A-**6**C depict sample user interfaces provided in an example of the present disclosure. While FIGS. **6**A and **6**B depicts user interfaces provided as part of a chat session at 20 Mar. 2018, FIG. **6**C depicts a user interface provided as part of another chat session at 28 Mar. 2018.

In the example corresponding to FIGS. **6**A and **6**B, an end user at client system **110**A is shown booking a travel ticket and thereafter seamlessly provided with an option to book a hotel using different chat servers according to aspects of the present disclosure. For example, in the Acme website shown in FIGS. **6**A-**6**C, when the end user clicks (though not shown) on the icon/link, the end user is displayed with chat client window display **600**. Acme chat client window **600** contains the display of all messages to and from the end user.

FIGS. **7**A and **7**B depict the events at each stage corresponding to the user interface experience of FIGS. **6**A and **6**B. FIG. **7**C depicts the events at each stage corresponding to the user interface experience of FIG. **6**C.

FIGS. **7**A-**7**C are shown with various files/modules that are shown invoked in the configuration data of FIGS. **5**A-**5**K, and also some of the internal executable modules implemented within the various modules. Modules of Logic controllers **440**A-**440**X are shown implemented as .js files. For example, module 1 and intent 1 of logic Controller 1 **440**A are shown implemented respectively as module1.js and intent1.js in FIGS. **7**A-**7**C. Helper modules (Travel.ai Helper **420**A, Image.ai Helper **420**B and OSVC CRM Helper **420**C) are implemented as classes in java script. Engine modules (Travel.ai Engine **460**A, Image.ai Engine **460**B and OSVC CRM Engine **460**C) may be implemented in the form of Javascript libraries, Java™ Archive (JAR) files, other programming languages, etc.

At **601** the end user from an Acme chat client is shown to have entered "Hello", which is represented as event **701** to main controller **410**. Responsive thereto, main controller **410** is shown to have invoked module1.js (in view of main controller **410** parsing sub-block **514**) of logic controller 1 **440**A at **702** to process the network packet/content. In view of sub-block **591**, main controller **410** triggers the process to fetch the customerId from the request body in the network packet header.

Main controller **410** updates an internal chat session table to indicate that the current chat session is allocated to logic controller 1 **440**A. Event **703** depicts invocation of Travel.ai Helper **420**A (selected according to implementation of logic controller 1 **440**A), which in turn is shown invoking Travel.ai Engine **460**A in event **704** to process the network packet.

The Travel.ai Engine **460**A strips the headers of the network packet, and the packet content (including "Hello") is encapsulated consistent with the requirements of chat server **260**A. The Travel.ai Engine examines the configuration data if needed to fetch the URL, user name and password (sub-block **511**) and sends the encapsulated packet (cloud packet) to chat server **260**A corresponding to Travel.ai Helper **420**A at event **705**. To enable reconstruction of network packets in the reverse direction, engine modules update the session mapping.

At **706**, chat server **260**A is shown to examine the encapsulated packet and forward a response (communicates an intent) assumed to represent the text, "Hello there, please advise if there is anything which I can help you with" along with the intent "+START_INTENT" to Travel.ai Engine **460**A.

At event **707**, Travel.ai Engine **460**A encapsulates the response (along with the "+START_INTENT") of chat server **260**A consistent with the requirements of Travel.ai Helper **420**A. Thereafter, Travel.ai Engine **460**A forwards the encapsulated response packet to Travel.ai Helper **420**A using the session mapping. At event **708**, Travel.ai Helper forwards the encapsulated response packet to the module1.js of logic controller 1 **440**A.

Module.js/intent.js of logic controllers appends a contextual data to the encapsulated response packet received from Helper modules. Contextual data indicates the module of logic controllers and the Engine that processed the response packet. At **709**, module1.js of logic controller 1 **440**A appends a contextual data to the encapsulated response packet indicating that the encapsulated response packet was processed by module1 and Travel.ai Engine. Thereafter, the appended response packet is forwarded to the main controller **410**.

Main controller **410** identifies the intent in the appended response packet. Thereafter, main controller truncates the intent and contextual data, invokes appropriate procedure in intent.js (of corresponding logic controller, selected according to the configuration data and based on the contextual data) and forwards the appended response along with the data fetched at event **702** to the appropriate procedure.

At **710**, main controller identifies the intent "START_INTENT" in the appended response packet and truncates the intent. In view of the contextual data in the appended response packet, main controller **410** is aware that the truncated response packet was processed by Travel.ai Engine and module1. After truncating the contextual data, main controller **410** parses lines **515** (of sub-block **511**). The configuration data therein indicates the main controller to parse sub-block **531** (of block **530**) to determine procedure 'start' of intent1.js to be invoked next. Accordingly, main controller **410** forwards the truncated response packet along with customerID (fetched at **702**) to 'start' of intent1.js (of logic controller 1 **440**A).

Responsive thereto, event **711** depicts invocation of Osvc CRM Helper **420**C (selected according to implementation of logic controller 1 **440**A), which inturn is shown invoking Osvc CRM Engine **460**C at **712** to process the identified intent.

Each of the engines and helpers encapsulates and reconstructs the network packets or response packets in a manner suitable for the corresponding chat servers/CRM systems as described above. The encapsulation of network packets and reconstruction of the response packets are not repeated for conciseness.

At **713**, Osvc CRM Engine **460**C examines the configuration data if needed to fetch the URL, username and password (sub-block **571**) and interfaces with CRM system 1 **280**A. Thereafter, Osvc CRM Engine **460**C sends the truncated response packet to CRM system 1 **280**A.

At **714**, CRM system 1 **280**A forwards a response (containing details of end user retrieved from CRM system 1 **280**A based on the customerId fetched at **702**) to the Osvc CRM Engine **460**C.

At **715**, Osvc CRM Engine **460**C forwards the response from CRM system 1 **280**A to Osvc CRM Helper **420**C, which inturn forwards to 'start' of intent1.js (of logic controller 1 **440**A) at event **716**.

At **717**, 'start' of intent1.js (of logic controller 1 **440**A) extracts name (for example, John Doe") of the end user from the response from CRM system 1 **280**A and constructs the greeting message to be sent to the end user. Thereafter, 'start' of intent1.js (of logic controller 1 **440**A) sends the constructed response message to main controller **410**.

At event **718**, main controller **410** forwards the reconstructed response message to the corresponding Acme chat client associated with the end user. Accordingly, the reconstructed response message "Hello there, John Doe, please advise if there is anything which I can help you with?" is displayed at **602** on the Acme chat client window of the end user.

In response thereto, at **603**, the user is shown to have entered "I would like to book a flight from Dubai to New York", which is represented as event **719** to main controller **410**.

At event **720**, main controller **410** is shown to have invoked module1.js (in view of main controller **410** parsing sub-block **514**) of logic controller 1 **440**A to process the new network packet/content.

Event **721** depicts invocation of Travel.ai Helper **420**A (selected according to implementation of logic controller 1

440A), which in turn is shown invoking Travel.ai Engine **460**A at **722** to encapsulate the new network packet.

Travel.ai Engine **460**A examines the configuration data if needed to fetch the URL, user name and password (sub-block **511**) and sends the encapsulated packet (cloud packet) to chat server **260**A corresponding to helper module **420**A at event **723**.

At **724**, chat server **260**A is shown to examine the encapsulated packet and forward a response assumed to represent the text, "Sure, I can help you with that. Could you please let me know the date when you want to book the flight?" to Travel.ai Engine **460**A with no intent appended to the response.

At event **725**, Travel.ai Engine **460**A encapsulates the response of chat server **260**A consistent with the requirements of Travel.ai Helper **420**A. Thereafter, Travel.ai Engine **460**A forwards the encapsulated response packet to Travel.ai Helper **420**A.

At event **726**, Travel.ai Helper forwards the encapsulated response packet to the module1.js of logic controller 1 **440**A.

At **727**, module1.js of logic controller 1 **440**A forwards the encapsulated response packet to the main controller **410**.

At **728**, main controller **410** identifies that there is no intent appended to the encapsulated response packet and therefore passes the encapsulated packet to the corresponding Acme chat client associated with the end user. Accordingly, the encapsulated response message "Sure, I can help you with that. Could you please let me know the date when you want to book the flight?" is displayed at **604** on the Acme chat client window of the end user.

In response thereto, at **605**, the user is shown to have entered "30th of this month", which is represented as event **729** to main controller **410**.

Event **730** is represented as events similar to events **720-723**. In a similar manner, event **731** is represented as events similar to events **724-727**. At **731**, chat server **260**A forwards a response assumed to represent the text, "What time of the day would you like to travel?" with no intent appended to the response.

At **732**, main controller **410** identifies that there is no intent appended to the encapsulated response packet and accordingly, the encapsulated response message "What time of the day would you like to travel?" is displayed at **606** on the Acme chat client window of the end user.

Responsive thereto, at **607**, the user is shown to have entered "Morning **6**", which is represented as event **733** to main controller **410**.

Event **734** is similar to event **730**. In a similar manner, event **735** is similar to event **731**. At **731**, chat server **260**A forwards a response assumed to represent the text, "Please choose from the available flights listed below: 'Emirates—EK 520' 'Etihad—EY 5411'" with no intent appended to the response.

At **736**, main controller **410** identifies that there is no intent appended to the encapsulated response packet and accordingly, the encapsulated response message "Please choose from the available flights listed below: 'Emirates—EK 520' 'Etihad—EY 5411'" is displayed at **608** on the Acme chat client window of the end user.

Responsive thereto, end user chooses one flight from the available list and at **609**, the user is shown to have chosen "Emirates—EK 520", which is represented as event **737** to main controller **410**.

In response thereto, main controller **410** is shown to have invoked module1.js (in view of main controller **410** parsing sub-block **514**) of logic controller 1 **440**A at **738** to process the network packet/content. Furthermore, at **738**, the network packet is forwarded to module1.js of logic controller 1 **440**A and then to chat server **260**A via Travel.ai Helper **420**A and Travel.ai Engine **460**A.

At event **739**, chat server **260**A is shown to examine the encapsulated packet and forward a response assumed to represent the text "Please confirm the below details: Date: 30 Mar. 2018; Time: 6:00 AM; Flight: Emirates—EK 520; Cost: 1100. Yes or No" along with the intent "GET_CUSTOMER_PREFERENCE" to Travel.ai Engine **460**A. The encapsulated response packet is forwarded to module1.js of logic controller 1 **440**A via Travel.ai Helper **420**A. Furthermore, module1.js of logic controller 1 **440**A appends a contextual data to the encapsulated response packet indicating that the encapsulated response packet was processed by module1 and Travel.ai Engine **460**A. Thereafter, the appended response packet is forwarded to the main controller **410**.

At **740**, main controller identifies the intent "GET_CUSTOMER_PREFERENCE" in the appended response packet and truncates the intent from the received packet. In view of the contextual data in the appended response packet, main controller **410** is aware that the truncated response packet was processed by Travel.ai Engine **460**A and module1. Accordingly, main controller **410** parses lines **515** (of sub-block **511**). The configuration data therein indicates the main controller to parse sub-block **534** (of block **530**) to determine procedure 'c$get_customer_info' of intent1.js to be invoked next. Accordingly, main controller **410** forwards the truncated response packet along with customerID (fetched at **702**) to procedure 'c$get_customer_info' of intent1.js (of logic controller 1 **440**A).

Responsive thereto, furthermore event **740** depicts invocation of Osvc CRM Helper **420**C (selected according to implementation of logic controller 1 **440**A), which inturn is shown invoking Osvc CRM Engine **460**C to process the identified intent. Osvc CRM Engine **460**C examines the configuration data if needed to fetch the URL, username and password (sub-block **571**) and interfaces with CRM system 1 **280**A. Thereafter, Osvc CRM Engine **460**C sends the truncated response packet to CRM system 1 **280**A.

At **741**, CRM system 1 **280**A forwards a response (containing name, age, gender, meal preference of end user retrieved from CRM system 1 **280**A based on the customerId fetched at **702**) to the Osvc CRM Engine **460**C. Osvc CRM Engine **460**C forwards the response from CRM system 1 **280**A to Osvc CRM Helper **420**C, which inturn forwards to 'c$get_customer_info' of intent1.js (of logic controller 1 **440**A). In response thereto, 'c$get_customer_info' of intent1.js (of logic controller 1 **440**A) extracts name, age, gender, meal preference (for example, John Doe, 35 years, Male, Veg respectively) of the end user from the response from CRM system 1 **280**A and constructs the confirmation message to be sent to the end user. Thereafter, 'c$get_customer_info' of intent1.js (of logic controller 1 **440**A) sends the constructed response message to main controller **410**.

At event **742**, main controller **410** forwards the reconstructed response message to the corresponding Acme chat client associated with the end user. Accordingly, the reconstructed response message "Please confirm the below details: Name: John Doe; Age: 35 years; Gender: Male; Meal: Veg; Date: 30 Mar. 2018; Time: 6:00 AM; Flight: Emirates—EK 520; Cost: $1100. Yes or No" is displayed at **610** on the Acme chat client window of the end user.

Responsive thereto, at **611**, end user is shown to have confirmed the details by choosing 'Yes', which is represented as event **743** to main controller **410**.

In response thereto, at **744**, main controller **410** is shown to have invoked module1.js (in view of main controller **410** parsing sub-block **514**) of logic controller 1 **440**A and module1.js forwards the network packet (confirmation message 'Yes') to chat server **260**A via Travel.ai Helper **420**A and Travel.ai Engine **460**A.

Event **745** is similar to event **739**. At event **745**, chat server **260**A is shown to examine the encapsulated packet and to book a flight according to the details confirmed at **611**. Thereafter, chat server **260**A forwards to Travel.ai Engine **460**A, a response assumed to represent the text "Your flight is successfully booked. Here is your flight itinerary" along with all the details of the booked flight and an intent "POSITIVE_END_INTENT" appended. The appended response packet is further forwarded to Travel.ai Helper **420**A and then to main controller **410** via module1.js of logic controller 1 **440**A.

At event **746**, main controller **410** reconstructs the response message to display the flight itinerary and forwards the reconstructed response message to the corresponding Acme chat client associated with the end user. Accordingly, the reconstructed response message "Your flight is successfully booked" and "Here is your flight itinerary" is displayed at **612**A and **612**B respectively on the Acme chat client window of the end user.

When main controller **410** identifies a "POSITIVE_END_INTENT", then main controller broadcasts metadata (indicating the updated status of the tasks completed in a particular module of a logic controller **440**A, in this example) to corresponding modules of remaining logic controllers **440**B-**440**X. For illustration, it is assumed that the remaining logic controllers are **440**B and **440**C.

At events **748** and **749**, main controller **410** is shown broadcasting metadata (indicating completion of flight booking task in module 1 of logic controller **440**A) to corresponding modules of remaining logic controllers **440**B and **440**C, in view of "POSITIVE_END_INTENT" appended at event **745**. In this example, metadata may include the place of origin and destination, time of flight, flight name, details of end user (name, age), etc., with appropriate tags according to any pre-specified convention. At event **748**, module2.js of logic controller 2 **440**B determines if a hotel can be booked. At event **749**, module3.js of logic controller 3 **440**C determines if a taxi can be booked.

Responsive to the broadcast of metadata, based on determination at events **748** and **749**, each of the logic controllers **440**B and **440**C sends a confidence level at events **751** and **752** respectively. Confidence level may be any number between 0 and 1 (both inclusive). In this example, current date of transaction is shown as 20 Mar. 2018 (10 days before the date of flight travel). Accordingly, logic controller 2 **440**B sends a confidence level of 0.8 (since hotel can be booked 10 days before the date of flight travel) and logic controller 3 **440**C sends a confidence level of 0.4 (since taxi can be booked later even on the date of flight travel). Therefore, hotel reservation (manifested in module 2.js of logic controller 2 **440**B) might be next most eligible transaction for the current transaction.

Main controller **410** chooses the logic controller with the highest confidence level/highest priority or a combination of both as the next most eligible logic controller. Accordingly, main controller **410** updates the internal chat session table to indicate that the current chat session is allocated to the most eligible logic controller.

Main controller **410** determines that module 2.js of logic controller 2 **440**B has sent a confidence level that is highest among those sent by corresponding modules of remaining logic controllers **440**B-**440**X.

In response thereto, main controller **410** updates the internal chat session table to indicate that the current chat session is allocated to logic controller 2 **440**B for hotel reservation purpose.

At event **753**, main controller **410** invokes module 2.js of logic controller 2 **440**B (in view of highest confidence level sent by logic controller 2 **440**B). Responsive thereto, Hotel.ai Helper **420**D (not shown in FIGS. **7**A-**7**C) is invoked (selected according to implementation of logic controller 2 **440**B), which in turn invokes Hotel.ai Engine **460**D (not shown in FIGS. **7**A-**7**C). Hotel.ai Engine **460**D examines the configuration data if needed to fetch the URL, user name and password (sub-block **521**) and sends the encapsulated packet (cloud packet) to chat server **260**C corresponding to Hotel.ai Helper **420**D. Chat server **260**C is shown to examine the broadcasted metadata and forwards a response assumed to represent the text, "Hi John Doe, would you like to book a hotel at New York on 30 Mar. 2018? Yes or No".

The events between module2.js, Hotel.ai Helper **420**D, Hotel.ai Engine **460**D and chat server **260**C are not shown in FIG. **7**B and are similar to interactions with respect to module1.js as explained above. The response packet is forwarded to main controller **410** at event **754**. The generated response packet is forwarded to end user at event **755** which is displayed at **613** on the Acme chat client window of the end user.

It may thus be appreciated that messages **612**B and **613** from chat servers **260**A and **260**C respectively are displayed as a response to input **611** provided by the end user in FIG. **6**B.

The user is shown to choose "No" at **614** and accordingly, the chat session ends at that point with no control to modules/intents of logic controller 2 **440**B.

If the user chooses "Yes", corresponding modules/intents of logic controller 2 **440**B are invoked in accordance with block **520** of FIG. **5**B. The corresponding operation will be apparent to a skilled practitioner by reading the disclosure herein.

It may thus be appreciated that all the transactions described above with respect to FIGS. **6**A-**6**B are performed in a single chat session, implying the user experience is in the same window as depicted there, and the corresponding packets exchanged would also reflect the continuum.

In another example corresponding to FIG. **6**C, an end user at client system **110**A is shown generating a boarding pass (having passport verified) and thereafter seamlessly booking a taxi using different chat servers according to aspects of the present disclosure.

At **620** the end user from an Acme chat client is shown to have entered "Hello", which is represented as event **760** to main controller **410**. Events **761**-**776** are similar to events **702**-**717**.

At event **777**, the reconstructed response message "Hello there, John Doe, please advise if there is anything which I can help you with?" and the flight itinerary is displayed at **621**A and **621**B respectively on the Acme chat client window of the end user. Here, the response from Travel.ai includes the flight itinerary of the end user displayed at **612**B.

In response thereto, at **622**, the user is shown to have entered "Could you please send me the boarding pass?", which is represented as event **778** to main controller **410**.

Events **779-782** are similar to events **702-705**. At **783**, chat server **260**A is shown to examine the encapsulated packet and forward a response assumed to represent the text, "Sure, I can help you with that. Could you please send across a scanned copy of passport for verification?" along with the intent "+ISSUE_BOARDING_PASS" (example unique intent key) to Travel.ai Engine **460**A. Events **784-786** are similar to events **707-709**.

At event **787**, main controller identifies the intent "ISSUE_BOARDING_PASS" in the appended response packet and truncates the intent. In view of the contextual data in the appended response packet, main controller **410** is aware that the truncated response packet was processed by Travel.ai Engine and module1. After truncating the contextual data, main controller **410** parses lines **515** (of sub-block **511**). The configuration data therein indicates the main controller to parse sub-block **535** (of block **530**) to determine procedure 'c$issue_boarding_pass' of intent1.js to be invoked next. Accordingly, main controller **410** forwards the truncated response packet along with customerID (fetched at **702**) to 'c$issue_boarding_pass' of intent1.js (of logic controller 1 **440**A).

Responsive thereto, event **788** depicts invocation of Osvc CRM Helper **420**C (selected according to implementation of logic controller 1 **440**A), which inturn is shown invoking Osvc CRM Engine **460**C at **789** to process the identified intent.

At **790**, Osvc CRM Engine **460**C examines the configuration data if needed to fetch the URL, username and password (sub-block **571**) and interfaces with CRM system 1 **280**A. Thereafter, Osvc CRM Engine **460**C sends the truncated response packet to CRM system 1 **280**A.

At **791**, CRM system 1 **280**A forwards a response (containing details of passport, if any, of end user retrieved from CRM system 1 **280**A based on the customerId fetched at **702**) to the Osvc CRM Engine **460**C.

At **792**, Osvc CRM Engine **460**C forwards the response from CRM system 1 **280**A to Osvc CRM Helper **420**C, which inturn forwards to 'c$issue_boarding_pass' of intent1.js (of logic controller 1 **440**A) at event **793**.

At **794**, 'c$issue_boarding_pass' of intent1.js (of logic controller 1 **440**A) extracts details of passport of the end user from the response from CRM system 1 **280**A and forwards the extracted passport details (if any) to main controller **410**.

The description is continued with the assumption that CRM system 1 **280**A does not contain the passport details of the end user.

At event **795**, main controller **410** forwards the truncated response packet to the corresponding Acme chat client associated with the end user. Accordingly, the reconstructed response message "Sure, I can help you with that. Could you please send across a scanned copy of passport for verification?" is displayed at **623** on the Acme chat client window of the end user.

In response thereto, at **624**, the user is shown to have uploaded an image file (for example, a copy of his passport) which is represented as event **796** to main controller **410**.

Responsive thereto, main controller **410** is shown to have invoked module1.js (in view of main controller **410** parsing sub-block **514**) of logic controller 1 **440**A at **797** to process the network packet/content.

Module.js of logic controllers **440**A-**440**X are implemented to select corresponding Helper modules **420**A-**420**(P+Q) and Engine modules **460**A-**460**(P+Q) according to the input type. For example, if the input type is image, then module1.js of logic controller 1 **440**A invokes Image.ai Helper **420**B; whereas if the input type is text, then module1.js of logic controller 1 **440**A invokes Travel.ai Helper **420**A.

Event **798** depicts invocation of Image.ai Helper **420**B (selected according to image input type at **624**/event **796**), which in turn is shown invoking Image.ai Engine **460**B at **799** to process the network packet.

At **799**A, Image.ai Engine **460**B examines the configuration data if needed to fetch the URL, user name and password (sub-block **512**) and sends the encapsulated packet (cloud packet) to chat server **260**B corresponding to Image.ai Helper **420**B.

At event **799**B, chat server **260**B is shown to examine the encapsulated packet and forward a response along with a corresponding intent to Image.ai Engine **460**B. The description is continued assuming that the end user has uploaded an authentic passport copy. Accordingly, chat server **260**B generates and sends boarding pass along with the intent "+POSITIVE_END_INTENT" to Image.ai Engine **460**B.

At event **799**C, Image.ai Engine **460**B encapsulates the response (along with the "+POSITIVE_END_INTENT") of chat server **260**B consistent with the requirements of Image.ai Helper **420**B. Thereafter, Image.ai Engine **460**B forwards the encapsulated response packet to Image.ai Helper **420**B using the session mapping.

At event **799**D, Image.ai Helper **420**B forwards the encapsulated response packet to module1.js of logic controller 1 **440**A.

At **799**E, module1.js of logic controller 1 **440**A appends a contextual data to the encapsulated response packet indicating that the encapsulated response packet was processed by module1 and Image.ai Engine. Thereafter, the appended response packet is forwarded to the main controller **410**.

At **799**F, main controller **410** identifies the intent "POSITIVE_END_INTENT" in the appended response packet and truncates the intent. In view of the contextual data in the appended response packet, main controller **410** is aware that the truncated response packet was processed by Image.ai Engine **460**B and module1. After truncating the contextual data, main controller **410** parses lines **516** (of sub-block **512**). The configuration data therein indicates the main controller to parse sub-block **541** (of block **540**) to determine procedure 'c$image_success' of intent2.js to be invoked next. Accordingly, main controller **410** forwards the truncated response packet to 'c$image_success' of intent2.js (of logic controller 1 **440**A).

Event **799**G depicts truncated response being forwarded to Travel.ai Helper **420**A for further processing.

At event **799**H, Travel.ai Helper **420**A reconstructs the boarding pass corresponding to the details displayed at **621**B/event **777**. Thereafter, Travel.ai Helper **420**A forwards the reconstructed response packet along with an intent "POSITIVE_END_INTENT" to 'c$image_success' of intent2.js (of logic controller 1 **440**A), which inturn forwards to main controller **410** at **799**I.

At event **799**J, the reconstructed image of boarding pass is displayed at **625** on the Acme chat client window of the end user.

At events **799**L and **799**M, main controller **410** is shown broadcasting metadata (indicating completion of generating boarding pass task in module 1 of logic controller **440**A) to corresponding modules of remaining logic controllers **440**B-**440**X, in view of "POSITIVE_END_INTENT" appended at event **799**H. The description is continued assuming the remaining logic controllers are **440**B and **440**C.

Responsive to the broadcast of metadata, each of the remaining logic controllers **440**B and **440**C sends a confidence level at events **7990** and **799**P respectively.

The description is continued assuming that the next most eligible logic controller is logic controller 3 **440**C for taxi booking purpose.

Main controller **410** determines that module 3.js of logic controller 3 **440**C has sent a confidence level that is highest among those sent by corresponding modules of remaining logic controllers **440**B and **440**C.

In response thereto, main controller **410** updates the internal chat session table to indicate that the current chat session is allocated to logic controller 3 **440**C for taxi booking purpose.

At event **799**Q, main controller **410** invokes module 3.js of logic controller 3 **440**C (in view of highest confidence level sent by logic controller 3 **440**C).

Responsive thereto, Taxi.ai Helper **420**E (not shown in FIGS. **7**A-**7**C) is invoked (selected according to implementation of logic controller 3 **440**C), which inturn invokes Taxi.ai Engine **460**E (not shown in FIGS. **7**A-**7**C). Taxi.ai Engine **460**E examines the configuration data if needed to fetch the URL, user name and password (block **528**) and sends the encapsulated packet (cloud packet) to chat server **260**D corresponding to Taxi.ai Helper **420**E. Chat server **260**D is shown to examine the broadcasted metadata and forwards a response assumed to represent the text, "Hi John Doe, would you like to book a taxi from New York airport on 30 Mar. 2018? Yes or No" to module3.js.

The events between module3.js, Taxi.ai Helper **420**E, Taxi.ai Engine **460**E and chat server **260**D are not shown in FIG. **7**C and are similar to interactions with respect to module1.js as explained above. The response packet is forwarded to main controller **410** at event **799**R. The generated response packet is forwarded to end user at event **799**S which is displayed at **626** on the Acme chat client window of the end user.

If the user chooses "No", the chat session ends at that point with no control to modules/intents of logic controller 3 **440**C.

If the user chooses "Yes", corresponding modules/intents of logic controller 3 **440**C are invoked in accordance with block **528** of FIG. **5**C, using corresponding intents ("intents_5" and "intents_6") though not shown but may be implemented in a similar manner as in blocks **530** and **530** respectively of FIGS. **5**D and **5**E.

In another embodiment of the present disclosure, at event **791**, assuming CRM system 1 **280**A contains valid passport of the end user (for example, from history of end user's previous interactions), then the reconstructed response message "Sure, I can help you with that. Could you please send across a scanned copy of passport for verification?" is replaced with details of valid passport and is forwarded to main controller **410**. Main controller **410** invokes the Travel.ai Helper **420**A and reconstructs the boarding pass as described at event **799**H. The process continues as described above.

It may further be appreciated that aspects of the present disclosure enable an end user to be served seamlessly using multiple chat servers in a single chat session.

As the interfacing unit **250** providing such a seamless interface is based on configuration data, the administrator is provided more control as to the specific interactions between various systems.

By taking advantage of intents provided by chat servers, the interfacing units are implemented to take advantage of various states determined by the chat services.

While the use of multiple chat servers by interfacing unit **250** is described in examples above as being controlled by configuration data, it should be appreciated that alternative approaches can be implemented to obtain similar feature in other ways as suited in corresponding environments. For example, an end user may specify interest in both tickets and hotel reservations upfront in the first message, for example, at **603** of FIG. **6**A, the end user may input "I would like to book a flight from Dubai to New York and also like some hotel reservations". Main controller **410** may split that message into two messages, one for purpose of flight reservation and another for the purpose of hotel reservation, and then process the first message first in accordance with the description above. Thereafter, main controller **410** automatically services the second message upon positive completion of the processing of the first message (e.g., upon receipt of "POSITIVE_END_INTENT") (instead of broadcasting meta data) based on block **520**.

Interfacing unit **250** according to aspects of the present disclosure can be implemented using various approaches. The description is continued with respect to an example embodiment in which the features are operative by execution of appropriately designed executable modules.

8. Digital Processing System

FIG. **8** is a block diagram illustrating the details of digital processing system **800** in which various aspects of the present disclosure are operative by execution of appropriate executable modules. Digital processing system **800** corresponds to interfacing unit **250**.

Digital processing system **800** may contain one or more processors such as a central processing unit (CPU) **810**, random access memory (RAM) **820**, secondary memory **830**, graphics controller **860**, display unit **870**, network interface **880**, and input interface **890**. All the components except display unit **870** may communicate with each other over communication path **850**, which may contain several buses as is well known in the relevant arts. The components of FIG. **8** are described below in further detail.

CPU **810** may execute instructions stored in RAM **820** to provide several features of the present disclosure. CPU **810** may contain multiple processing units, with each processing unit potentially being designed for a specific task. Alternatively, CPU **810** may contain only a single general-purpose processing unit.

RAM **820** may receive instructions from secondary memory **830** using communication path **850**. RAM **820** is shown currently containing software instructions constituting shared environment **825** and application programs **826**. Shared environment **825** includes operating systems, device drivers, virtual machines, etc., which provide a (common) run time environment for execution of application programs **826**. The various modules described above may be contained in application programs **826** executing in shared environment **825**.

Graphics controller **860** generates display signals (e.g., in RGB format) to display unit **870** based on data/instructions received from CPU **810**. Display unit **870** contains a display screen to display the images defined by the display signals. Input interface **890** may correspond to a keyboard and a pointing device (e.g., touch-pad, mouse) that may be used to provide appropriate inputs (e.g., for editing the configuration data). Network interface **880** provides connectivity to a network (e.g., using Internet Protocol), and may be used to communicate with other systems (of FIG. **1**) connected to the network (**140**/**120**).

Secondary memory **830** may contain hard drive **835**, flash memory **836**, and removable storage drive **837**. Secondary

memory **830** may store the data (for example, portions of the configuration data as appropriate files) and software instructions (for implementing the flowchart of FIG. **2**), which enable digital processing system **800** to provide several features in accordance with the present disclosure. The code/instructions stored in secondary memory **830** either may be copied to RAM **820** prior to execution by CPU **810** for higher execution speeds, or may be directly executed by CPU **810**.

Some or all of the data and instructions may be provided on removable storage unit **840**, and the data and instructions may be read and provided by removable storage drive **837** to CPU **810**. Removable storage unit **840** may be implemented using medium and storage format compatible with removable storage drive **837** such that removable storage drive **837** can read the data and instructions. Thus, removable storage unit **840** includes a computer readable (storage) medium having stored therein computer software and/or data. However, the computer (or machine, in general) readable medium can be in other forms (e.g., non-removable, random access, etc.).

In this document, the term "computer program product" is used to generally refer to removable storage unit **840** or hard disk installed in hard drive **835**. These computer program products are means for providing software to digital processing system **800**. CPU **810** may retrieve the software instructions, and execute the instructions to provide various features of the present disclosure described above.

The term "storage media/medium" as used herein refers to any non-transitory media that store data and/or instructions that cause a machine to operate in a specific fashion. Such storage media may comprise non-volatile media and/or volatile media. Non-volatile media includes, for example, optical disks, magnetic disks, or solid-state drives, such as storage memory **830**. Volatile media includes dynamic memory, such as RAM **820**. Common forms of storage media include, for example, a floppy disk, a flexible disk, hard disk, solid-state drive, magnetic tape, or any other magnetic data storage medium, a CD-ROM, any other optical data storage medium, any physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, NVRAM, any other memory chip or cartridge.

Storage media is distinct from but may be used in conjunction with transmission media. Transmission media participates in transferring information between storage media. For example, transmission media includes coaxial cables, copper wire and fiber optics, including the wires that comprise bus **850**. Transmission media can also take the form of acoustic or light waves, such as those generated during radio-wave and infra-red data communications.

Reference throughout this specification to "one embodiment", "an embodiment", or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Thus, appearances of the phrases "in one embodiment", "in an embodiment" and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

Furthermore, the described features, structures, or characteristics of the disclosure may be combined in any suitable manner in one or more embodiments. In the above description, numerous specific details are provided such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules, hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments of the disclosure.

While various embodiments of the present disclosure have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present disclosure should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

It should be understood that the figures and/or screen shots illustrated in the attachments highlighting the functionality and advantages of the present disclosure are presented for example purposes only. The present disclosure is sufficiently flexible and configurable, such that it may be utilized in ways other than that shown in the accompanying figures.

What is claimed is:

1. A method of managing relationship with users, the method being performed in an interfacing unit, the method comprising:

maintaining a configuration data indicating a respective set of chat servers each available for at least one purpose of a plurality of purposes;

receiving a request on a chat session for a chat conversation from a user for a first purpose;

identifying, based on the configuration data, a first chat server for the first purpose from the respective set of chat servers suitable for generating responses for the chat conversation;

receiving a first sequence of inputs from the user;

interfacing with the first chat server to receive a first sequence of messages corresponding to the first sequence of inputs from the first chat server;

forwarding, on the chat session, as respective first responses to the first sequence of inputs, wherein each first response comprises text of a corresponding message of the first sequence of messages;

determining based on the configuration data, a second chat server for a second purpose for continuation of the chat session, wherein the second purpose is manifested in the conversation between the user and the first chat server on the chat session, wherein the second purpose is different from the first purpose;

receiving a second sequence of inputs, following the first sequence of inputs, from the user on the same chat session;

interfacing with the second chat server to receive a second sequence of messages corresponding to the second sequence of inputs from the second chat server, wherein the chat conversation is continued with the second chat server in the same chat session without requiring selection of the second chat server by the user; and

forwarding, on the same chat session, respective second responses to the second sequence of inputs, wherein each second response comprises text of a corresponding message of the second sequence of messages.

2. The method of claim **1**, wherein the configuration data further indicates a respective action required for each intent of a respective plurality of intents manifested in chat conversations, the method further comprising:

determining a sequence of current intents manifested at corresponding time instances in the chat conversation;

determining a respective action to be performed for each current intent by examining the configuration data; and

performing the corresponding action.

3. The method of claim **2**, wherein the interfacing unit switches from the first chat server to the second chat server

upon performing a first action, wherein the first action is associated with a first intent in the configuration data,

wherein the first intent is contained in the sequence of current intents.

4. The method of claim **3**, wherein the first action comprises execution of a module which causes the further actions of:

forwarding, to each of the set of chat servers, a set of metadata representing a current state of the chat conversation as a part of the first action;

determining a set of suitable chat servers depending on the respective responses received from each of the set of chat servers;

setting one of the set of suitable chat servers as the second chat server.

5. The method of claim **4**, wherein the configuration data comprises identifiers of a set of customer relationship management (CRM) systems,

wherein a second action indicates that a state of the chat conversation is to be stored in one of the CRM systems, and

wherein a third action indicates that information is to be retrieved and forward to the second chat server to enable the second chat server to process a request from the user contained in the chat conversation.

6. The method of claim **2**, wherein each of the inputs and the messages is according to natural language, wherein the inputs are forwarded to the set of chat servers in natural language and the messages are received from the set of chat servers also in natural language,

wherein each intent is received from the corresponding chat server.

7. The method of claim **1**, wherein each of said the first sequence of inputs and said the second sequence of inputs is encapsulated in a respective network packet with a destination field indicating that the network packet terminates at the interfacing unit,

wherein each of the first sequence of messages and the second sequence of messages is encapsulated in a respective packet with a source field indicating that the packet originates in at the interfacing unit.

8. The method of claim **1**, wherein a first message of the first sequence of messages includes a a second portion specifying the second purpose, wherein the interfacing unit services the first purpose in the first sequence of inputs, and thereafter sends the second portion to the second chat server automatically to cause the second purpose also to be serviced.

9. A non-transitory machine readable medium storing one or more sequences of instructions, wherein execution of the one or more instructions by one or more processors contained in an interfacing unit causes the interfacing unit to perform the actions of:

maintaining a configuration data indicating a respective set of chat servers each available for at least one purpose of a plurality of purposes;

receiving a request on a chat session for a chat conversation from a user for a first purpose;

identifying, based on the configuration data, a first chat server for the first purpose from the respective set of chat servers suitable for generating responses for the chat conversation;

receiving a first sequence of inputs from the user;

interfacing with the first chat server to receive a first sequence of messages corresponding to the first sequence of inputs from the first chat server;

forwarding, on the chat session, respective first responses to the first sequence of inputs, wherein each first response comprises text of a corresponding message of the first sequence of messages;

determining based on the configuration data, a second chat server for a second purpose for continuation of the chat session, wherein the second purpose is manifested in the conversation between the user and the first chat server on the chat session, wherein the second purpose is different from the first purpose;

receiving a second sequence of inputs, following the first sequence of inputs, from the user on the same chat session;

interfacing with the second chat server to receive a second sequence of messages corresponding to the second sequence of inputs from the second chat server, wherein the chat conversation is continued with the second chat server in the same chat session without requiring selection of the second chat server by the user; and

forwarding, on the same chat session, respective second responses to the second sequence of inputs, wherein each second response comprises text of a corresponding message of the second sequence of messages.

10. The non-transitory machine readable medium of claim **9**, wherein the configuration data further indicates a respective action required for each intent of a respective plurality of intents manifested in chat conversations, the actions further comprising:

determining a sequence of current intents manifested at corresponding time instances in the chat conversation;

determining a respective action to be performed for each current intent by examining the configuration data; and

performing the corresponding action.

11. The non-transitory machine readable medium of claim **10**, wherein the interfacing unit switches from the first chat server to the second chat server upon performing a first action, wherein the first action is associated with a first intent in the configuration data,

wherein the first intent is contained in the sequence of current intents.

12. The non-transitory machine readable medium of claim **11**, wherein the first action comprises execution of a module which causes the further actions of:

forwarding, to each of the set of chat servers, a set of metadata representing a current state of the chat conversation as a part of the first action;

determining a set of suitable chat servers depending on the respective responses received from each of the set of chat servers;

setting one of the set of suitable chat servers as the second chat server.

13. The non-transitory machine readable medium of claim **12**, wherein the configuration data comprises identifiers of a set of customer relationship management (CRM) systems,

wherein a second action indicates that a state of the chat conversation is to be stored in one of the CRM systems, and

wherein a third action indicates that information is to be retrieved and forward to the second chat server to enable the second chat server to process a request from the user contained in the chat conversation.

14. The non-transitory machine readable medium of claim **10**, wherein each of the inputs and the messages is according to natural language, wherein the inputs are forwarded to the

set of chat servers in natural language and the messages are received from the set of chat servers also in natural language,

wherein each intent is received from the corresponding chat server.

15. The non-transitory machine readable medium of claim **9**, wherein each of the first sequence of inputs and the second sequence of inputs is encapsulated in a respective network packet with a destination field indicating that the network packet terminates at the interfacing unit,

wherein each of the first sequence of messages and the second sequence of messages is encapsulated in a respective packet with a source field indicating that the packet originates in at the interfacing unit.

16. The non-transitory machine readable medium of claim **9**, wherein a first message of the first sequence of messages includes a second portion specifying the second purpose, wherein the interfacing unit services the first purpose in the first sequence of inputs, and thereafter sends the second portion to the second chat server automatically to cause the second purpose also to be serviced.

17. An interfacing unit facilitating management of relationship with users, the interfacing unit comprising:

a memory to store instructions;

one or more processors to execute the instructions stored in the memory to cause the interfacing unit to perform the actions of:

maintaining a configuration data indicating a respective set of chat servers each available for at least one purpose of a plurality of purposes;

receiving a request on a chat session for a chat conversation from a user for a first purpose;

identifying, based on the configuration data, a first chat server for the first purpose from the respective set of chat servers suitable for generating responses for the chat conversation;

receiving a first sequence of inputs from the user;

interfacing with the first chat server to receive a first sequence of messages corresponding to the first sequence of inputs from the first chat server;

forwarding, on the chat session, respective first responses to the first sequence of inputs, wherein each first response comprises text of a corresponding message of the first sequence of messages;

determining based on the configuration data, a second chat server for a second purpose for continuation of the chat session, wherein the second purpose is manifested in the conversation between the user and the first chat server on the chat session, wherein the second purpose is different from the first purpose;

receiving a second sequence of inputs, following the first sequence of inputs, from the user on the same chat session;

interfacing with the second chat server to receive a second sequence of messages corresponding to the second sequence of inputs from the second chat server, wherein the chat conversation is continued with the second chat server in the same chat session without requiring selection of the second chat server by the user; and

forwarding, on the same chat session, respective second responses to the second sequence of inputs, wherein each second response comprises text of a corresponding message of the second sequence of messages.

18. The interfacing unit of claim **17**, wherein the configuration data further indicates a respective action required for each intent of a respective plurality of intents manifested in chat conversations, the method further comprising:

determining a sequence of current intents manifested at corresponding time instances in the chat conversation;

determining a respective action to be performed for each current intent by examining the configuration data; and

performing the corresponding action.

19. The interfacing unit of claim **18**, wherein each of the inputs and the messages is according to natural language, wherein the inputs are forwarded to the set of chat servers in natural language and the messages are received from the set of chat servers also in natural language,

wherein each intent is received from the corresponding chat server.

20. The interfacing unit of claim **17**, wherein each of the first sequence of inputs and the second sequence of inputs is encapsulated in a respective network packet with a destination field indicating that the network packet terminates at the interfacing unit,

wherein each of the first sequence of messages and the second sequence of messages is encapsulated in a respective packet with a source field indicating that the packet originates in at the interfacing unit.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 10,594,635 B2
APPLICATION NO. : 15/957932
DATED : March 17, 2020
INVENTOR(S) : Kuncheria et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specification

In Column 1, Line 62, delete "FIG. 7A-7C" and insert -- FIGS. 7A-7C --, therefor.

In Column 9, Line 50, delete "Figure SI" and insert -- Figure 5I --, therefor.

In Column 10, Line 39, delete "Figure SI" and insert -- Figure 5I --, therefor.

In the Claims

In Column 23, Line 42, in Claim 7, delete "in at" and insert -- at --, therefor.

In Column 23, Line 44, in Claim 8, delete "a a" and insert -- a --, therefor.

In Column 25, Line 14, in Claim 15, delete "in at" and insert -- at --, therefor.

In Column 26, Line 44, in Claim 20, delete "in at" and insert -- at --, therefor.

Signed and Sealed this
Twenty-seventh Day of October, 2020

Andrei Iancu
Director of the United States Patent and Trademark Office